STACK INFRASTRUCTURE

Black&White®

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TECHNICAL SPECIFICATIONS

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1. GENERALITY

This document **MIL05B-L22-XX-XX-SP-A-00001 Technical Specifications** - for Civil Works, is an integral part of the executive project MIL 05B - CAMPUS VIGNATE, via Galileo Galilei, SNC - 20052 Vignate (MI).
This project was drawn up by L22, part of Lombardini22 S.p.A. with registered office in via Lombardini 22 in Milan.
This volume, together with the remaining volumes of the Technical Report, the drawings and documents produced by the Client relating to the general conditions of supply, must be countersigned for acceptance and returned to the Client. The examination of all documents is therefore a fundamental condition for proceeding with the listing and execution of the plants. Everything contained in it is also essential for the correct reading of the indications and prescriptions contained in the other project documents. If there are any doubts about the correct application of their contents, the designer must be informed so that he can give the necessary clarifications in time.
The designer cannot be held responsible for any consequence due to failure to comply with the above.

EXCLUSIONS:
This project relates only to the construction of building MIL05B with the associated external project areas and does NOT include the following work on the existing lot:

- ***asbestos removal***
- ***demolition of existing buildings***
- ***removal and disposal of 2 existing diesel tanks and related soil remediation***
- ***underground services diversion on the lot (MV power line and sewerage system)***

2. CLARIFICATION

These descriptions indicate the minimum functional performance required.
The Contractor must carefully examine all the data and requirements contained in this document as it will remain, for contractual reasons, fully and unconditionally responsible for the correct execution of the work, guaranteeing the conditions and requirements of perfect rule of the art.
As regards the topics not covered, or details not specified, it is prescribed that the materials adopted and the execution of the works correspond to the European standards of equal value and have unified dimensions according to the UNI and ISO standards in force.
Further clauses relating to the definition of the relationship between the Client and the Contractor will be defined in the Contract of which this document with the Annexes is an integral part.
Materials for which samples have been requested may not be installed until after acceptance by the Works Management.
The Contractor must not install materials rejected by the Works Management, thus removing them from the construction site; The products to be installed must be those indicated in the project or, in the absence of specification, those indicated in the list of products/items.
The duration of the warranty is 24 **(twenty-four**) months from testing, as established by the Civil Code art.1667; during this period all parts that prove to be defective must be replaced free of charge and as soon as possible.
The prices include and compensate all expenses for work vehicles, all necessary supplies and their processing and use, allowances for passages, storage, construction sites, temporary and other

occupations, provisional work vehicles and any other condition provided for in the safety plan attached to the documentation, none excluded, loads, transport and unloading and anything else necessary to give the work completed in a workmanlike manner and in full efficiency, the prices themselves include any compensation for all charges that the contractor will have to bear for this purpose, even if not explicitly specified or referred to in the various articles of the list, except as explicitly excluded.
If the project documentation contains conflicting data or information, the most expensive and safety-enhancing data must be considered.
The contract is established according to what is defined by the provisions of the Contract drawn up by the Client.
The Contractor assigned the Contract will be required to carry out a punctual and rigorous verification of all the quantities indicated in these bills of quantities, which are indicative and therefore take into account any possible variables that may have emerged as a result of such verification in the valuation presented. Therefore, nothing may be requested by the Contractor, during the course of work or during the final accounting, beyond what is contractually provided, even if there are any discrepancies between the quantities indicated in the bills of quantities delivered and those of the works actually carried out.
All the works relating to the contract will be carried out by the contractor in accordance with the prescriptions and conditions established in the project documents, taking into account, however, that these prescriptions are not limiting, as it is hereby announced that the contractor expressly undertakes to carry out in a workmanlike manner, in compliance with the regulations in force, to provide a perfectly functioning complex included in the offer price. In any case, it is the responsibility and burden of the Contractor to ensure that everything derives from the application of clearly incorrect indications, due, for example, to printing errors, or from the failure to perform parts that are essential for safety, if such errors/omissions are detectable on the basis of the technical knowledge that the Contractor, by law, must possess, having to guarantee the compliance of the works with the rule of the art.
All works must be coordinated with the execution of the other works and the construction site timing must be submitted to the Works Management. During the works, in accordance with the needs of the site and the Client, temporary works may be requested to allow the use of some spaces and/or passages. The Contractor will also be responsible for the operation of areas in operation that must be kept functioning during the works.
No change in the execution of the planned works may be made by the Contractor without having received the prior approval and written authorization of the Client and the Works Manager.
Should the personnel be responsible for actions deemed serious by the Works Manager, the same is recognized as having the authority to order the immediate expulsion of the same without the Contractor being able to request an extension or damages.
The Contractor, upon signing the contract, indemnifies the Client from any possible action for recourse by the subcontractors in the event of a dispute between the Contractor and the Subcontractor.
The contractor shall be responsible for the following points:

- Drafting of the construction project to be submitted to the DL for approval and drafting of variants requested by the same;

- Preparation of suitable spaces on site in which to exhibit all the materials and variants of the same to be used in the project, as well as the search for the same and those that may be required by the DL;
- Preparation of mock-ups of complex elements, the latter will be indicated at the discretion of the DL and must be carried out on site complete with all finishes;
- Charges relating to practices for the application and observance of Standards, Certificates, etc.
- Instruction to the client's staff;
- Testing charges;
- Warranty charges;
- Charges for the cleaning of glass facades of any shape and height, if the project also involves interventions on the roads. These cleanings must be carried out with suitable means at the end of the civil works with the aim of delivering the finished building in a workmanlike manner and the facades clean and in perfect condition;
- Charges relating to documentation of as-built drawings, manuals, operating requirements, certifications pursuant to current regulations, maintenance requirements;
- Documentation relating to artifacts such as metal works, windows and doors, hooking systems, structural systems, façade elements, etc.;
- Charges relating to safety on site;
- Charges for coordination with other Contractors;
- Daily site cleaning;
- Cleaning of the areas at the end of the construction site before the delivery of the areas;
- Costs for cleaning the construction site: if they are deemed insufficient, the DL may order to carry out cleaning pro rata;
- Disposal of waste materials in authorized landfills;
- Guarding charges and custody of the materials laid and stored;
- Accantieramento;
- Charges for connections and temporary installations;
- Personnel hygiene charges;
- Documentation relating to artifacts such as metal works, windows and doors, hooking systems, structural systems, façade elements

2.1. New rules on joint and several liability

As a result of the new rules on joint and several liability introduced by art. 13 ter of Legislative Decree no. 83 of 22.06.2012, converted into Law no. 134 of 07.08.2012, the Client will pay the consideration due to the contractor only upon presentation by the latter of the documentation certifying that the

payments to the Treasury of the withholding taxes on employment income and VAT, already expired, have been correctly executed by the same (and any subcontractors), or other documentation deemed suitable by the Tax Administration.

2.2. Documentation relating to the request for Fire Prevention Certificate

The installed systems, materials and equipment must strictly comply with the laws and all the regulations in force (ISPESL, Laws and EN, CEI, VVF, Uni standards, etc.).
The Contractor shall be responsible for the verification and control and shall be responsible for:
Promptly and in writing report to the DL any discrepancy in the project documents of the aforementioned Laws and Regulations.
Promptly and in writing to report to the DL any changes to the Regulations and Laws in force that may occur during the course of the work; and the adaptation of the systems to them without further charges to the Customer
The Contractor will be responsible for all the costs deriving from any permits, inspections, certificates, tests by Authorities, Companies, Competent Bodies, necessary for the installation and execution in a workmanlike manner and in accordance with the Standards and laws of the systems.
The Contractor is responsible for obtaining these Certificates, Tests, etc., in good time, so as not to cause delays in the execution and delivery of the plants.
The contractor will be responsible for drawing up certifications and declarations, aimed at proving that the construction elements, products, materials, equipment, devices, systems and system components, relevant for safety purposes in the event of fire, have been built, installed or installed according to the rule of the art, in compliance with current fire safety legislation.
The aforementioned documentation, where not already defined by specific regulations, must be drawn up using the appropriate models defined by the Central Directorate of Prevention and Technical Safety of the Fire Brigade Department, which can be downloaded from the institutional website (http://www.vigilfuoco.it).
The Ministerial forms on the site are as follows:
MOD. PIN 2.2 CERT REI – MOD. PIN 2.3 DICH. PROD – MOD. PIN 2.4 DICH. IMP. –MOD. PIN 2.5 CERT. IMP – MOD. PIN. 2 LPG – MOD. 2.1 LPG – MOD. PIN 2.7 LPG – DECLARATION OF COMPLIANCE.
The fire resistance certification (Mod. CERT: REI) of load-bearing and/or separating products/construction elements signed by a fire-fighting professional, must be accompanied by integral calculation reports signed by a fire-fighting professional, test and classification reports issued by a "test laboratory" and anything else deemed necessary to prove fire resistance.
The declarations of conformity (Mod. DICH. PROD.) it must be accompanied by a declaration of conformity of the approved products, or EC declarations of conformity, test reports and/or classification reports for non-approved and CE marked products and any declarations of correct installation drawn up by the installers and anything else deemed necessary to prove the conformity of the materials and products used with the required performance.
It will be the Contractor's obligation to deliver the documentation relating to the materials certified for Fire Prevention purposes when drafting the report of completion of the works.

2.3. Charges related to practices for the application and observance of Standards, Certificates

The installed artifacts, materials and equipment must strictly comply with the laws and all the regulations in force (Laws and EN, CEI, VVF, ASL, Uni standards, etc.).
The Contractor shall be responsible for the verification and control and shall be responsible for:

- Promptly and in writing report to the DL any discrepancy in the project documents of the aforementioned Laws and Regulations;
- Promptly and in writing to report to the DL any changes to the Regulations and Laws in force that may occur during the course of the work; and the adaptation of the works to the same without further charges to the Client;
- The Contractor will be responsible for all the charges deriving from any permits, inspections, certificates, tests by Authorities, Companies, Competent Bodies, necessary for the installation and execution in a workmanlike manner and in accordance with the Regulations and laws of the works;
- The Contractor is responsible for obtaining these Certificates, Tests, etc., in good time, so as not to cause delays in the execution and delivery of the works;
- This includes the compilation and preparation of the paperwork necessary for the occupation of public land, loading and unloading, scaffolding installation, requests to condominiums, adjacent properties, connections to energy distributors and entities and those for the approval of part of systems by the competent authorities;
- If the conditions required by the Authorities, Companies, or Entities are less restrictive than the conditions indicated in these Specifications, the latter must be observed.

2.4. Please note

"Before installation on site, the Contractor must always deliver to the D.L., the seismic tightness verification reports, relating to the construction elements without a structural function, by way of example but not limited to: infills and false ceilings; (par. 7.2.3 NTC 18) and plants (par. 7.2.4 and par. 7.3.7.3 NTC 18)".

2.5. Training for the Client's personnel

The contractor must provide the Client and the persons indicated by him with all the information and instructions necessary for the correct management, operation and maintenance of the work and must ensure the presence of specialists of the individual structures if necessary.

2.6. Testing charges

The testing will take place according to the procedures indicated below; the request for testing must be submitted in writing to the Client and to the Inspector who will be appointed.
The dates and methods of execution must be agreed. The Contractor must make its staff available for the entire period relating to the testing operations. The Contractor must provide the instruments necessary for the measurements and surveys of the test, requested by the Tester.
The Technical Testing Standards are described in the following section.

2.7. Documentation charges

During the execution and completion of the works, the Contractor must deliver all the documentation required by law, as described below:

2.7.1. Assembly drawings

The Contractor must carry out all the assembly drawings necessary for a perfect execution of the works even if not specifically required by the D.L.
By assembly construction drawings we mean those drawings of the works containing all the details and particulars necessary for the construction and assembly of the building and for their installation carried out by the Contractor on the basis of the project documents.
The assembly construction drawings must be submitted for approval to the D.L., which will indicate its comments and specify any changes to be made within 14 days of delivery. The Contractor shall submit the correct and updated drawings.
All assembly construction drawings must be accurately listed, numbered and dated; the indications contained in them must be precise, consistent and without the possibility of misunderstanding.
The assembly drawings must be prepared by the Contractor in time for approval to be given before the start of the related works and in time for the procurement of materials and equipment.
It should be noted that the approval given by the D.L. means checking that the drawings themselves conform to the project and approval of the set of drawings themselves and not of every single data and sizing indicated.
The Contractor, therefore, will remain entirely responsible for all the data indicated on the drawings of the coordination between the various elements and the subsequent operation of the related systems.

2.7.2. "As built" drawings

Upon completion of the works, the Contractor must provide the project drawings "as built", which show what has been achieved including the variants carried out during the work; the same will be provided on magnetic support (DWG format drawings for Autocad 2022 or higher) and in triplicate signed paper.
The technical documents will include:

- brand, type and model of each element;
- technical data of the elements;
- plans and section with indication of what has been carried out;
- tables indicating all the characteristics of the various products.

2.7.3. Instruction, operation and maintenance manuals

The Contractor must produce the Operation and Maintenance Manual of the work to be submitted to the approval of the Works Management, before carrying out the tests.
The documentation will be presented in two copies.
A copy will be returned with comments and the contractor is required to make the required corrections within 14 days of receipt of the documentation.

The Operation and Maintenance Manual should be divided into sections, with a logical sequence between them. The contents of each section should be explained in a general table of contents.
The operation and maintenance manual must be collected in one or more bins of suitable size and solid construction.
The manual shall include at least the following parts:

Introduction

It will contain the subject of the description, a list of abbreviations, and a list of drawings.
It must also contain a series of addresses and telephone numbers useful for the exercise of the work carried out (personnel for urgent repairs, equipment service centers, etc.).

General description of the works

It will contain a detailed description of the works and the principle schemes to illustrate how they work.
The description will be written in such a way as to be easily understandable even for "non-technical" personnel.

Project and reference data

It will contain project data, booklets, certifications and all the elements related to the various products used.

2.8. Documentation relating to the presentation of S.C.I.A. Fire Prevention

Pursuant to Article 4 of Presidential Decree no. 151 of 01.08.2011, the Contractor will be obliged to deliver the documentation relating to the materials certified for Fire Prevention purposes and their installation by filling in the appropriate ministerial forms

The contractor will be responsible for drawing up certifications and declarations, aimed at proving that the construction elements, products, materials, equipment, devices, systems and system components, relevant for safety purposes in the event of fire, have been built, installed or installed according to the rule of the art, in compliance with current fire safety legislation.

The aforementioned documentation, where not already defined by specific regulations, must be drawn up using the appropriate models defined by the Central Directorate of Prevention and Technical Safety of the Fire Brigade Department, which can be downloaded from the institutional website (http://www.vigilfuoco.it).

The Ministerial forms on the site are the following (an indicative list is provided – please refer to the acts of the competent ministerial body for any update that is considered implicitly binding for the CONTRACTOR):

MOD. PIN 2.2 CERT REI – MOD. PIN 2.3 DICH. PROD – MOD. PIN 2.4 DICH. IMP. –MOD. PIN 2.5 CERT. IMP – MOD. PIN. 2 LPG – MOD. 2.1 LPG – MOD. PIN 2.7 LPG – DECLARATION OF COMPLIANCE.

The fire resistance certification (Mod. CERT: REI) of load-bearing and/or separating products/construction elements signed by a fire-fighting professional, must be accompanied by integral calculation reports signed by a fire-fighting professional, test and classification reports issued by a "test laboratory" and anything else deemed necessary to prove fire resistance.

The declarations of conformity (Mod. DICH. PROD.) it must be accompanied by a declaration of conformity of the approved products, or EC declarations of conformity, test reports and/or classification reports for non-approved and CE marked products and any declarations of correct

installation drawn up by the installers and anything else deemed necessary to prove the conformity of the materials and products used with the required performance.

2.9. Documentation for updating the Work File

In order to allow the Safety Coordinator to update the Work File at the end of the works, pursuant to Article 92 of Legislative Decree 81-2008 and subsequent amendments and additions without incurring criminal sanctions, it is the Contractor's obligation to prepare and deliver on time all the final documentation (as-built, technical data sheets, safety data sheets, use and maintenance manuals, declarations of conformity, declarations of correct installation, Fire Brigade documents, etc.).
Otherwise, the payment of the last SAL will not be authorized until the same Contractor has provided the complete final documentation to the Safety Coordinator.

2.10. Obligations relating to safety on the construction site

As regards the obligations relating to safety on site, the Contractor must refer to the indications contained in the Safety and Coordination Plan (PSC) and its annexes.

2.11. Coordination with other contractors or entities

The Contractor shall provide and receive all information and data useful or necessary to other contractors (e.g. electrical systems, technological systems, lifts) especially where there may be interferences, connections and connections or where assistance works are required (openings, bases, etc.). The Contractor must define with a work program what this information is and the delivery times of the same.
The data must be provided in the form of drawings or written communications and a copy must be sent to the DL.
Any additional charges due to delays in general installation or on the general schedule of works due to non-compliance with the above shall be charged to the Contractor.
The Contractor must, before starting the works and in any case in good time, define in accordance with the DL the necessary works and assistance, for which he will provide precise drawings and instructions.

2.12. Minimum site equipment for the Works Supervision

Given the duration of the construction site, the Contractor must make available on site:

- A room D.L. for meetings with table, chairs and cabinet for document and project filing
- Daily cleaning of said rooms.

It should be noted that depending on the type of contract, the minimum equipment may be varied upon specific indication by the Works Management.

2.13. Standards Compliance Methods

All the works must be carried out with care, fully respecting all the indications contained in the bills of quantities, specifications, executive drawings and construction details, also safeguarding the parts of structures and finishes already carried out which, if damaged, must be restored by and at the

expense of those who caused the damage. In the event of difficulties in identifying who caused the damage, the costs will be divided pro-rata among the companies present on the site.
No damage must be caused to existing structures and systems, including those of tenants, neighbors, near the border areas; the safety criterion of both the operating persons and the parts of the system that remain must be respected; all precautions must be taken to avoid dangerous situations and compromise the subsequent operation of the construction site.
The site must be left perfectly clean, tidy, free of rubble and fully functional to meet the function for which it was designed, both during the execution of the works and at the time of the final delivery of the premises.
All works must be carried out according to the good rule of the art, the evaluation of which is the exclusive responsibility of the WORKS MANAGER appointed by the CLIENT, who is also responsible for the high supervision of the works and the verification of compliance with the project to be carried out, and whose judgment on the quality of the same is unquestionable.

2.14. Rules for the evaluation of works

All prices, relating to the works to be carried out, include the certifications required by the laws in force or by the contractual provisions and all ancillary expenses and charges.
Wherever the use of a particular type of material/product or similar is indicated, it is in any case understood that it must be previously approved by the WORKS MANAGEMENT on the basis of technical specifications of the product, submitted to the same WORKS MANAGEMENT by the CONTRACTOR.
The prices shown in the Price List refer to works carried out by applying the best technique, suitable labor and materials of excellent quality so that the artifacts, supplies and services are complete and finished in a workmanlike manner in relation to the design tables and the best explanations that the WORKS MANAGEMENT will want to explain.
All materials will be of the best quality in their respective categories, without defects and in any case with quality and merits equal to or superior to what is described in this list. The origin of the individual materials will be freely chosen by the CONTRACTOR, provided that no explicit waste is manifested by the WORKS MANAGEMENT.
The materials supplied will comply with all the requirements of this price list as well as all the laws in force on the subject or with the UNI, CEI, NFPA, BS standards in force at the time of supply. The CONTRACTOR will be responsible for the discipline of the construction site as far as it is competent and undertakes to ensure that its technical staff and/or workers comply with the prescriptions and orders received. THE CONTRACTOR will in any case be liable for damage caused by the inexperience and/or negligence of its technicians and/or workers.
These measurement rules for the accounting of works, which have general value, always and in any case the calculation methods indicated in the Project, Bills of Quantities and Price List shall always prevail.

2.15. Specifications for the works to be carried out

These specifications indicate the main operations to be carried out to achieve what is indicated in the project documents. The technical data and quantitative indications reported in the following calculation are provided with the aim of facilitating the drafting of the offers and making them homogeneous and easier to compare.

The attached bill of quantities is purely indicative and is intended to facilitate the assessment of the extent of the works by the CONTRACTOR.
The CONTRACTOR is therefore required to carry out the technical checks and calculations on the basis of the attached drawings and the purpose of the work and the general description referred to above, as well as on the basis of an inspection that it intends to carry out in the building where the works covered by these indicative specifications will be carried out and to indicate in its offer any substantial discrepancies.
However, the quantities have no value for the determination of the price as the contract will be a lump sum and not a measure.
The works must satisfy the purpose of the same according to the needs and intentions of the CUSTOMER which the CONTRACTOR must clearly understand from the examination of the technical documents attached to this description of the works, asking for clarification if it has doubts. If no doubts or perplexities are raised by the CONTRACTOR, the project will be considered included in all its peculiarities and/or particularities.
All ancillary charges necessary for the fulfilment of this purpose of the work are understood to be included, even if not specifically included in this description: therefore, the future recognition of any completion work or provisional work that is omitted due to forgetfulness or for other reasons from the present offer is hereby excluded.
The prices relating to the works to be carried out include the costs of masonry assistance, supplies and installation of everything indicated in the items and everything necessary for operations, including ancillary ones, scaffolding, machinery and equipment necessary, the certifications required by the laws in force and all ancillary expenses and charges.
All costs include charges to ensure the safe execution of the works in accordance with the law.
The CONTRACTOR declares that it always uses a price assessed on the worst economic situation and therefore revalueable, for the same work only downwards.
The costs of demolition, removal and disposal of waste include lowering to the loading level, loading, transport and disposal to the PP. DD., according to the laws in force and the related charges.
Where a type of material/product is indicated, it is understood that a similar material/product of the same characteristics can be used, in any case only if previously approved by the WORKS MANAGEMENT on the basis of the technical specifications of the product, submitted to the same WORKS MANAGEMENT by the CONTRACTOR. In the event of failure to comply with the prior authorization, the WORKS MANAGEMENT may request its replacement.
The CONTRACTOR is obliged to carry out the placement of any work or equipment that is ordered by the WORKS MANAGEMENT, within the times indicated by the same, even if provided by other companies, to agree on the methods and to coordinate the work.
The installation must be carried out with all the necessary care and caution; the material or artifact must be suitably protected, if necessary, even after it has been placed, the CONTRACTOR being the only one responsible for damage of any kind that may be caused to the things installed, even from the traffic of workers during and after the execution of the works, until the end and delivery, even if the particular placement takes place under the supervision or assistance of the personnel of other companies, suppliers of the material or product.

2.16. General notes on the work

The quantities shown are provided for indicative purposes only; the CONTRACTOR COMPANY must verify its adequacy and submit any observations before the formulation of the final economic offer;
The price will therefore have to be developed in full, with precise and reasoned notes;
Before the start of the works, the WORKS MANAGEMENT, the Safety Coordinator together with the CONTRACTOR, will carry out an inspection in which any particularities and/or existing services, or priority requests, will be marked with colored spray;
No other party other than the WORKS MANAGEMENT and the CUSTOMER may authorize any modification or change of program;
The CONTRACTOR is obliged to carry out an inspection of the areas subject to intervention and to sign a declaration of the visit.

2.17. General requirements for the execution of the works

The CONTRACTOR must ascertain the presence of pipes and pipes that could be affected by the excavation works, verifying that they are out of service and agreeing with the WORKS MANAGEMENT, any safety manoeuvre.
All the necessary precautions must be taken to prevent any injury to persons and any damage to the residual works and to the surrounding areas, works and artefacts. The raising and lowering of materials must take place exclusively with lifting means or fall pipes, with simultaneous loading on the means of transport to the landfills.
The materials, which at the sole discretion of the WORKS MANAGEMENT, are to be recovered must be freed from the mortars, cleaned and transported with care to the places indicated by the WORKS MANAGEMENT itself.
In the event of failure to carry out the above, the CUSTOMER reserves the right to have the work carried out by another company and to charge the expenses incurred to the CONTRACTOR with methods to be defined, within a time limit that will be defined at the discretion and care of the WORKS MANAGEMENT.

2.18. Processing at night and on holidays

It is specified that the works in the Civil Works Specifications must be carried out in phases, to be agreed with the Client, with the possibility that they will be carried out at night and on holidays.
All the items in the document must be quantified taking into account the above as no increase/variant will be granted to entrusted works.

2.19. Order of documents

It should be noted that the following technical specifications must be considered supplementary to the provisions of the bill of quantities. Should technical differences occur, the Contractor shall consider valid those that guarantee the highest technical and/or safety standards (of persons and property).

2.20. Testing and sampling of materials, equipment and components

The Contractor shall carry out tests of materials or assembled components of the same when this is requested by the Client or by the D.L./D.A./D.A. and in the manner agreed upon by the same; The results must be communicated in writing in order to be able to give approval.

The above tests will be required above all in the case of materials with insufficient documentation from the manufacturer or supplier, or for solutions and applications of elements, materials and components of materials for which it is considered necessary to verify their operation before approval for installation.
The tests will be carried out on site or elsewhere as agreed.
The Contractor shall provide, at the request of the D.L./D.A. and in the manner agreed upon by the same, samples of equipment materials and/or methods of execution and construction of plant components.
The samples must be clearly listed and marked so that approval is given without the possibility of misunderstanding.
If the samples submitted to the D.L./D.A. are not approved by the latter, the Contractor must submit others until approval.
Before proceeding with the procurement of all the materials, equipment and components, described in the bill of quantities or in any case to be installed in the system, the Contractor must submit the technical, performance and dimensional characteristics of the components to the approval of the D.L./D.A., which will respond within 14 days, according to the following procedure:

- Material sampling
- transmission of the technical sheets of the material or component highlighting the technical characteristics;
- transmission to the D.L./D.A. of the document with the attachments;
- preparation of any mock-up where required by the DL
- preparation of any amendments, additions or replacements until complete approval by the D.L./D.A.

3. HOW EACH JOB CATEGORY IS PERFORMED

It should be noted that, within these Specifications, whenever a decree or law is cited, reference is made to the same and to all subsequent amendments and/or additions that have occurred up to the time of actual use of the Specifications.

3.1. Excavations, embankments, demolitions, pilings

3.2. Reliefs, cornerstones, routes

Before the start of the works, the Contractor must verify the compliance of the dimensioned plans, sections and profiles attached to the contract, including any updates received during the work, requesting, within 15 days from the delivery of the aforementioned drawings, all the necessary clarifications; after this deadline, all the papers and their requirements are considered accepted.
It will be the responsibility of the Contractor to provide for the construction and conservation of easy-to-identify cornerstones and the tracing and staking of any external areas affected by the works to be carried out, with the use of modine and temporary reference structures.
Excavations in general
Excavations in general for any work, by hand or by mechanical means, must be carried out according to the project drawings and the geological and geotechnical report as prescribed by current legislation, as well as according to the particular prescriptions that will be given to the executive act by the Works Management.
In carrying out excavations in general, the Contractor must proceed in such a way as to prevent landslides and landslides, remaining not only fully responsible for any damage to persons and works, but also obliged to provide for the removal of the collapsed materials at his own expense and expense.
The Contractor shall also ensure at its own expense that the water flowing to the surface of the ground is diverted so that it does not spill into the cables.
Materials from excavations in general, if they are not usable, or not deemed suitable, at the sole discretion of the Management, for other use in the works, must be taken to waste outside the site of the construction site, to public discharges, or to areas that the Contractor must provide for at its own care and expense.
Should the materials coming from the excavations be used subsequently, they must be deposited in a suitable place with the consent of the Works Management, and then be resumed at the appropriate time. In any case, the materials deposited must not be detrimental to the works, to public or private property and to the free flow of water flowing on the surface.
The Works Management may have the materials deposited in contravention of the previous provisions removed, at the expense of the Contractor.

3.3. Excavation protection

Temporary barrier to surround and defend excavations and works in the water, both for foundations and for works of art, for defense or bank walls to be built by driving fir or pine poles into the ground, double wall of fir planks, contrasting reinforcement crossbars between the two walls, all the necessary materials, the bindings, nails and any tie rods.

3.4. Excavations

Excavations or earthworks are those necessary for the levelling or arrangement of the land on which the buildings are to be built, for cutting embankments, for the formation of courtyards, gardens, basements, support surfaces for foundation slabs, crawl spaces, recessed ramps or road trenches, etc., and in general all those carried out in open section on a large surface where it is possible to remove the excavated materials avoiding their lifting, albeit with the formation of temporary ramps, etc.
Therefore, those that are below the ground level, or the project road level (if lower than the first) will also be considered excavations when the excavations have the characteristics mentioned above.

3.5. Foundation or trench excavations

Foundation excavations in general are those recessed and with a narrow section necessary to give rise to the foundation walls or pillars proper.
In any case, those to give rise to sewers, pipes, ditches and gutters will be considered as foundation excavations.
Whatever the nature and quality of the soil, foundation excavations must be pushed up to the depth that the Works Management will order at the time of their execution, taking due account of the Ministerial Decree of 17 January 2018 Technical Standards for Construction and subsequent amendments, concerning the technical standards on the land and the criteria for the execution of retaining and foundation works.
The depths indicated in the delivery drawings are therefore of simple notice and the contracting authority reserves the full right to vary them to the extent it deems most convenient, without this giving the Contractor any reason to make exceptions or requests for special compensation, having only the right to payment for the work performed, with the contractual prices established for the various depths to be reached. It is forbidden for the Contractor, under penalty of demolishing what has already been done, to work on the masonry before the Works Management has verified and accepted the plans of the foundations.
The foundation planes must generally be horizontal, but for those works that fall on inclined pitches they must, at the request of the Works Management, be arranged in steps and also with certain counterslopes.
Once the foundation masonry has been completed, the excavation that may have had to be carried out in addition around it must be diligently filled and compacted, at the care and expense of the Contractor, with the same excavated materials, up to the level of the primitive natural soil.
The excavations for foundations must, when necessary, be solidly propped up and dismantled with strong reinforcements, so as to abundantly secure the workers against any danger, and prevent any landslide of material during the execution of both excavations and masonry.
The Contractor is responsible for any damage to the works, to persons, to public and private property that may occur due to the lack or insufficiency of such shoring and deburring, which he must provide for on his own initiative, also adopting all the other precautions deemed necessary, without refusing for any pretext to comply with the instructions given to him in this regard by the Works Management.
As the masonry proceeds, the Contractor may recover the timber constituting the reinforcements, provided that they are not reinforcements forming an integral part of the work, to be therefore remained in place as the property of the Administration; the timber, however, which, in the opinion of the Works Management, could not be removed without danger or damage to the work, must be abandoned in the excavations.

3.6. Excavations for earthing systems

- Construction of an excavation carried out by mechanical means, with restoration of the soil (or bituminous mantle), for the installation of copper rope for earth dispersion systems and laying of the conductor at a depth of at least mt. 0.50 to be carried out both on country soil and on bituminous surface.
- Realization of an excavation carried out by hand, with restoration of the ground (of the bituminous surface or of the pavement), for the installation of copper rope for earth dispersion systems and laying of the conductor at a depth of at least mt. 0.50 to be carried out both on country soil and on bituminous surface.

3.7. Detected

All those earthworks carried out to form the road body, the garrison works, the areas for squares and the tax plans for pavements of any type are considered surveyed.
Depending on the nature of the works to be carried out, the company must submit, when requested, to the works management first the program and then the results of the geotechnical investigations, static and/or dynamic penetrometric tests, load tests and everything necessary to determine the stratigraphic, hydrogeological and physical-mechanical characteristics of the sediment soils.
An adequate number of laboratory tests must be carried out on undisturbed, half-destroyed or reworked samples taken during the investigations.
All operations for the execution of embankments or backfills will be carried out with the use of material from temporary site deposits or from other places chosen by the Contractor and approved by the works management, the use of clayey material being strictly prohibited.
Before using the materials from the excavations of the same site or from the borrowed quarries, the Contractor must also carry out a careful series of investigations to provide the construction management with complete documentation regarding the physical-mechanical characteristics of the materials.
The preparation of the area where the embankment will be carried out must include the cutting of any plants, the uprooting of roots, shrubs, etc. and their sending to landfill as well as the complete removal of the underlying vegetal soil.
The embankments are classified into the following categories:

a) filling embankments;
b) motorway embankments;
c) special embankments (reinforced lands).

In the first case (embankments from filling) the material must be spread in regular layers with uniform density and predetermined thickness, including any compaction required by the works management, which must be carried out in layers of 30 cm. thickness and the materials must have, once compaction has taken place, a density equal to 90% of the maximum compaction density identified by the tests carried out in the laboratory.
In the second case (motorway embankments), only calcareous or gravelly materials must be used, screened in the dimensions required by the technical specifications or by the works management, without prejudice to the rule that the maximum sizes allowed for the material intended for embankments do not exceed two thirds of the thickness of the compacted layer.

In the third case (surveyed in reinforced earth) only calcareous and gravelly materials screened with medium-small sieves must be used in the dimensions specified by the technical standards or by the works management; these materials must in any case be free from plant residues or organic substances. When the use of metal reinforcements is envisaged, the materials to be used must have the following characteristics: absence of sulphides, water-soluble sulphates less than 500 mg/kg, chlorides less than 100 mg./kg., pH between 5 and 10 and electrical resistivity greater than 1,000 ohms/cm for works in a dry environment and greater than 3,000 ohms/cm for works immersed in water.
In any case, the construction of each type of embankment must provide for the laying of the material carried out in layers of constant thickness and in such a way as to avoid segregation phenomena; Each layer must be installed only after the approval of the state of compaction of the previous layer, the thickness of each individual layer must be established on the basis of precise design indications or provided by the Works Management.
Compaction will be carried out after verifying the water content present in the materials to be used for the embankment and which must be close (+/- 2%) to the optimal levels indicated by laboratory tests for each type of material used. All operations must be carried out gradually and the passage of the rollers or machines must provide for an overlapping of the compaction bands of at least 10% of the width of the roller itself to ensure complete uniformity.
In the case of compaction carried out on areas or parts of land bordering on masonry, facings or artefacts in general, vibrating plates or hand-operated rollers must be used within a distance of two metres from these elements, with the necessary precautions not to damage the works already carried out. In these cases, the works management may require the use of 25/50 kg of cement to be mixed for each cubic meter of material to be compacted to obtain suitable levels of stabilization of the areas close to the structures already built.
The formation of embankments according to the above specifications must include:

- the preparation of adequate slopes to facilitate the outflow of rainwater;
- the profiling of the slopes;
- any refills of material that may be necessary after the taxiing and compacting operations of the various layers;
- the shaping of the edges.

3.8. Backfilling

Backfilling or filling of excavations must be carried out with materials free of organic substances from site deposits or other places subject to control by the works management and must include:

- levelling and arrangement of the filling soil by mechanical means or by hand;
- compaction in layers not exceeding 30 cm. thick;

Wetting and any reloading of material to be carried out in the manner already indicated.

3.9. Scaffolding, reinforcing structures

All scaffolding and temporary work structures must be built in complete compliance with the regulations in force for these works and in compliance with accident prevention regulations.
1) Metal scaffolding - must meet the following specifications:

- All structures of this type with heights greater than mt. 20 must be carried out on the basis of a project drawn up by a qualified engineer or architect;
- The assembly of these elements will be carried out by specialized personnel;
- The metal elements (rods, pipes, joints, supports) must be marked with the manufacturer's mark;
- Both the structure in its entirety and the individual parts must have adequate ministerial certification;
- All support rods must be made of seamless profiles;
- The base of each upright must consist of a plate with an area 18 times greater than the area of the polygon circumscribed by the base section of the upright;
- The scaffolding must be equipped with longitudinal and transverse bracing capable of withstanding both compressive and tensile stresses;
- All the joints between the various elements, the fixing of the deck boards, the protections for the door sills, the handrails and any valances or anti-debris nets must be checked.

2) Cantilevered scaffolding - will be built, only in special cases, in the following ways:
- the support beams must be of such a length that they can be connected to each other, within the overhanging surfaces, with suitable beams anchored behind the masonry of any façade served by the scaffolding;
- The plank must be adherent and without spaces or detachments of the individual parts and must also not protrude for more than 1.20 meters

3) Shoring - they must be made with steel, wood or metal tubular props of various sizes solidly anchored in the support and thrust points and with bracing that makes the individual elements solid; they will have a point of application close to the area of injury and a support base anchored on a stable support.

4) Reinforcement beams - they can have temporary or permanent reinforcement functions and will consist of wood, steel or sheet metal elements with profiled, shaped or solid sections and will be installed with adequate damping in the masonry, on special reinforced shoulders or with anchors suitable for the various conditions of application.

3.10. Material Consolidating Systems:

Injections of cement mortars - The intervention area will be the subject of a careful preliminary investigation with appropriate techniques (beating, coring, thermography) for the identification of internal cavities and aggressive substances. After cleaning the surfaces, the decohesed parts will be consolidated by injecting cement mortar at low pressure, with a sand/cement ratio of 0.6 to 0.8 with the addition of anti-shrinkage agents or fluidizers; the holes, at the rate of at least 2-3 per square meter, will be equidistant or in any case in relation to the spread of the cracks.
To prevent the injected mortar from escaping, the insertion areas and the damaged surface areas will be sealed after the insertion of the adduction pipes. The injection of the mixture will take place symmetrically and constantly, from the bottom up. Once cementing has been completed, the holes will be sealed with cement mortar.

It is essential that the treated surfaces are perfectly dry, at room temperature between +5°C and +25°C and relative humidity at a maximum of 60/70%.

Injections of epoxy resins - The intervention area will be the subject of a careful preliminary investigation with appropriate techniques (beating, coring, thermography) for the identification of internal cavities and aggressive substances. After cleaning the surfaces, the decoesed parts will be consolidated by means of low-pressure injection of epoxy resin; the holes, at the rate of at least 2-3 per square meter, will be equidistant or in any case in relation to the spread of the cracks. In the case of brick masonry, the distance will be a maximum of 50 cm, in those made of concrete blocks it will be a few meters.

To prevent the resin from escaping, after inserting the supply pipes for 2/3 of the depth of the wall, the insertion areas and the damaged surface areas will be sealed. The injection of the mixture will take place symmetrically and constantly, from the bottom up. Once cementing has been completed, the holes will be sealed with cement mortar.

It is essential that the treated surfaces are perfectly dry, at room temperature between +5°C and +25°C and relative humidity at a maximum of 60/70%.

Stone consolidants with silicone resins - Before proceeding with the execution of the work, all overhangs and surfaces not subject to intervention must be protected; the supports will then be prepared by brushing, cleaning and possible restoration.

The consolidant based on silicone resins will be applied in several coats, depending on the absorption of the surface, in any case always waiting for the drying of the previous layer.

It is essential that the treated surfaces are perfectly dry, at room temperature between +5°C and +25°C and relative humidity at a maximum of 60/70%.

Consolidants for stone with injections of epoxy resins - The intervention area will be the subject of a careful preliminary investigation with appropriate techniques (beating, coring, thermography) for the identification of internal cavities and aggressive substances. After cleaning the surfaces, the decoesed parts will be consolidated by means of low-pressure injection of epoxy resin; The holes, at the rate of at least 2-3 per square meter, will be equidistant or in any case in relation to the spread of the cracks, which in this case must be less than 4-6 mm wide. In the case of stone masonry, the distance between the holes will be 60-80 cm.

To prevent the resin from escaping, after inserting the supply pipes for 2/3 of the depth of the wall, the insertion areas and the damaged surface areas will be sealed. The injection of the mixture will take place symmetrically and constantly, from the bottom up. Once cementing has been completed, the holes will be sealed with cement mortar.

It is essential that the treated surfaces are perfectly dry, at room temperature between +5°C and +25°C and relative humidity at a maximum of 60/70%.

Material protection systems

Silicone resin-based protective products - Before proceeding with the execution of the work, all overhangs and surfaces not subject to intervention must be protected; the substrates will then be prepared by brushing, cleaning and possible restoration.

The silicone resin-based protective coating will be applied in several coats according to the absorption of the surface, in any case always waiting for the previous layer to dry.

It is essential that the treated surfaces are perfectly dry, at room temperature between +5°C and +25°C and relative humidity at a maximum of 60/70%.

Acrylic resin-based protective products - Before proceeding with the execution of the work, all overhangs and surfaces not subject to intervention must be protected; the substrates will then be prepared by brushing, cleaning and possible restoration.
The colorless protective acrylic resin-based coating will be applied in several coats, depending on the absorption of the surface, wet on wet until rejected.
It is essential that the treated surfaces are perfectly dry, at room temperature between +5°C and +25°C and relative humidity at a maximum of 60/70%.
Anti-scratch and anti-writing protection - Before proceeding with the execution of the work, all overhangs and surfaces not subject to intervention must be protected; the supports will then be prepared by brushing, cleaning and possible restoration.
The protective (transparent, water-repellent, anti-written solvent-based formulation) will be applied by brush or spray in two successive coats, following the manufacturer's specific instructions.
It is essential that the treated surfaces are perfectly dry, at room temperature between +5°C and +25°C and relative humidity at a maximum of 60/70%.
Stone protectors with silicone resins - Before proceeding with the execution of the work, all overhangs and surfaces not subject to intervention must be protected; the supports will then be prepared by brushing, cleaning and possible restoration.
The silicone resin-based protector will be applied in two coats, based on the absorption of the surface and the manufacturer's instructions, in any case always waiting for the previous layer to dry.
It is essential that the treated surfaces are perfectly dry, at room temperature between +5°C and +25°C and relative humidity at a maximum of 60/70%.
Stone protectors with acrylic copolymer resin-based film - Before proceeding with the execution of the work, all overhangs and surfaces not subject to intervention must be protected; the supports will then be prepared by brushing, cleaning and possible restoration.
The acrylic copolymer-based protective coating will be applied in two coats, depending on the absorption of the surface and the manufacturer's instructions, in any case always waiting for the previous layer to dry.
It is essential that the treated surfaces are perfectly dry, at room temperature between +5°C and +25°C and relative humidity at a maximum of 60/70%.
Silicone resin-based brick protector - Before proceeding with the execution of the work, all overhangs and surfaces not subject to intervention must be protected; the substrates will then be prepared by brushing, cleaning by water washing and possible restoration. Subsequently, when the joints are completely hardened, they will be cleaned with nylon fibre pads impregnated with slightly abrasive granules of different densities.
The silicone resin-based protector will be applied in two coats, depending on the absorption of the surface and the manufacturer's instructions.
It is essential that the treated surfaces are perfectly dry, at room temperature between +5°C and +25°C and relative humidity at a maximum of 60/70%.
Protective products for bricks with acrylic resin-based film - Before proceeding with the execution of the work, all overhangs and surfaces not subject to intervention must be protected; the substrates will then be prepared by brushing, hydrowashing and possible restoration.
The acrylic resin-based protective coating will be applied in two coats, depending on the absorption of the surface and the manufacturer's instructions, in any case always waiting for the previous layer to dry.

It is essential that the treated surfaces are perfectly dry, at room temperature between +5°C and +25°C and relative humidity at a maximum of 60/70%.

3.11. Drains

All drainage works must be carried out with stones or river mixtures placed on a concrete slab and a bottom drainage tunnel made with cement pipes installed with open joints or with perforated galvanized steel pipes.
When laying the stone, all the necessary precautions must be used to avoid settling phenomena following the laying itself.
1) Drains carried out with "non-woven fabric" - In lateral drainage or in the presence of soils with high percentages of low-grain material, a "non-woven fabric" filter in polyester with double ligament with a minimum weight of 350 gr/m must be made; The sheets must be sewn together or with an overlapping of the flaps of at least 30 cm. The lower part of the nonwovens, in contact with the bottom of the drainage cable and up to a height of 10 cm on the verticals, must be soaked with hot bitumen in the amount of 2 kg/sqm; it will also be necessary to arrange for the exit from the drainage cavity of a quantity of non-woven equal to twice the width of the cavity itself.
Subsequently, the filling will be carried out with stone material which must have a grain size between 10 and 70 mm; Once the filling is complete, the non-woven fabric that comes out at the top will be superimposed and on which a compacted earth cover must be made.
2) Drainage close to masonry walls - Drainage works carried out in contact with masonry walls built against the ground must provide for a complete waterproofing treatment of the external surfaces of the walls themselves carried out with:
a) two layers of hot-coated bitumen;
b) two layers of reinforced polyester sheaths crossed and welded to the entire vertical surface of the wall;
c) a layer of waterproofing sheath and a rigid mat in contact with the stone.
All hot bitumen sheaths or coatings must extend to the entire vertical surface in contact with the earth and have a flap that completely covers the head of the wall itself on which a stone cover or a metal flashing must be applied as final protection.
At the base of the stone, a bottom drainage channel will be built with cement pipes installed with open joints or with perforated galvanized steel pipes.
The stone material, to be positioned inside the drainage excavation, must have a grain size between 10 and 70 mm which will be installed with all the necessary precautions to avoid damage to the drainage pipe already installed on the bottom of the excavation and soil settling phenomena subsequent to the laying itself.

3.12. Demolitions and removals

The demolition of masonry, concrete, etc., both partial and complete, must be carried out in an orderly manner and with the necessary precautions, so as not to damage the remaining masonry, to prevent any injury to the workers and to avoid inconvenience or disturbance.
It is therefore forbidden to throw materials in general from above, which must instead be transported or guided downwards, and to raise dust, so both the masonry and the resulting materials must be suitably wet.

Partial demolition - Before starting the works in question, the Contractor must ascertain the nature, state and construction system of the works to be demolished. Unless otherwise specified, the Contractor shall arrange the most suitable technique, the means of work, the machinery and the use of personnel.
The disbursements concerned must therefore be interrupted, the area of the works will be appropriately delimited, the passages well identified and suitably protected as well as all areas subject to falling materials.
All unsafe structures will have to be shored up and all balcony compartments or openings will be barred after the possible demolition of parapets and fixtures.
The demolitions will proceed in a homogeneous way, avoiding the creation of areas of structural instability.
All parts of the building or structures not affected by demolition interventions must be shored up and reinforced in such a way as to avoid any consequences on the structures themselves.
It is strictly forbidden to use labour on the parts to be demolished; in the case in question, it will be necessary to proceed using special scaffolding independent of the demolition areas; These scaffoldings must be equipped, where necessary, with intermediate service bridges whose passage points are protected with mats, barriers or shelters designed to protect the safety of workers and people passing through in public transit areas, also providing for the installation of day and night signals.
In the case of adjacent buildings exposed to risks associated with the work to be carried out, appropriate shoring or reinforcements must also be provided to ensure the most complete safety of people or things parked or passing through the immediate vicinity.
Particular precautions will be taken in the presence of toxic vapours deriving from hydroxy or electrical cuts.
During the demolition phase, the accumulation of waste materials must be absolutely avoided, both on the structures to be demolished and on the provisional works or wherever dangerous overloads may occur.
The resulting materials must therefore be immediately removed or transported down with suitable equipment and avoiding the lifting of dust or debris; however, it will be absolutely forbidden to throw materials from above.
Demolition, dismantling and removal must be limited to the prescribed parts and dimensions; if, due to lack of precautions or error, these interventions are extended to parts that are not due, the Contractor will be required, at its own expense, to restore the same, without prejudice to any liability for any damage.
All materials from the operations in question, unless otherwise specified, will remain the property of the Contracting Authority, without prejudice to the latter's responsibility for the selection, transport and storage of the materials that can be used in the areas established by the works management and the transport of waste materials to landfills.
Demolition of roofs - The first operations to be carried out for the demolition of roofs will be those relating to the removal of the roofing mantle (tiles or prefabricated elements), flashings, gutters, flues and chimneys; at this point it will be possible to proceed with the dismantling of the support structures of the roof itself, taking care to start with the elements of the small frame continuing with the medium and then the large.
The necessary scaffolding will preferably be equipped inside the building, otherwise all the personnel employed must have adequate support areas on scaffolding anchored exclusively to the ground or

on the main structure. The work surfaces or scaffolding must be built at a distance from each other not exceeding the floor below. 2; if the void between the two walking levels should be higher, the contractor is strictly obliged to prepare intermediate floors.
Demolition of flat floors - The floor will first have to be lightened with the demolition of the roof floors or internal footfall, then the tiles and vaults will be removed and finally the joists of the support frame. The dismantling of the joists must be carried out with a series of precautions which are:

- Do not create levers towards the perimeter load-bearing walls to remove the joists that will have to be cut if necessary;
- To create a widespread shoring with support functions for the structure to be demolished; the temporary shoring structures must be independent from those supporting the scaffolding built to create work areas and protection of the workforce.

Before the demolition of slabs made of solid reinforced concrete, surveys must be carried out to ascertain the position of the reinforcing rods in order to proceed, consequently, with the demolition by sectors.
Demolition of vaulted floors - Also in this case, a series of shoring of the adjacent wall structures will have to be carried out to counterbalance the thrusts generated by the removal of the vaults; then the actual vaults will be demolished, starting with the key of the vault itself and continuing with a spiral pattern.
Total demolitions - In the case of demolition of entire buildings or significant parts of them, all protective measures must be prepared, consisting of scaffolding, sheet metal, mats and shelters capable of guaranteeing the total safety of the workers engaged in these works and of the public in transit in the immediate vicinity.
Particular attention should be paid to the creation of protected passages and adequate fences that prevent approaching danger areas; All the protections indicated must be appropriately delimited with day and night signs that make the work areas perfectly visible.
During the demolition of buildings, the use of explosives is strictly prohibited, unless otherwise expressly prescribed, even on large parts; All demolitions will be carried out by hand, with a pneumatic hammer or with other tools deemed technically and legally suitable.
In the demolition of parts connecting the building affected by the works and the adjacent ones, techniques for removing materials will be used that involve only labor with light tools or small support equipment.
Nb: The demolition of existing buildings is the subject of a specific contract for which the contractor may not request any additional charge for the execution of the demolitions covered by this document.

4. PHYSICAL SECURITY

The project shall comply with the Physical Security Baseline for B-Class Facilities V4.0

4.1. Perimeter

A prominent address sign or monument should be located near the roadway passing the main entry gate to identify the property for emergency services. The sign shall be adequately lit during hours of darkness. Either ambient light from the main gate or direct lighting shall accomplish this. The project includes a complete perimeter fence system around the property. The fence will be 2.4 meters high and constructed in continuity with the fence of the MIL05A campus. It will be set back 3 meters from

the property line. Trees, vegetation, and any material that could aid a breach or provide concealment will be cleared 3m on both sides of the fence. Fencing and gates shall match in style and function, including height and colour, ensuring a uniform grade and alignment across the installation. Posts and rails shall be designed and installed contiguously, without gaps or anomalies. Fencing may have blunt and slightly rounded posts and pale tops which is a preference to address safety concerns. Spacing between pales (including between pales and posts) should be no greater than 8.25 cm. The clearance between the bottom of the fence (including gates when closed) and the finished grade shall be no more than 5 cm.

4.2. Main Entry

Construct entry gates of non-impact-resistant palisade style steel or style that matches the fence if a style other than palisade is approved for use. Install signage and reflective safety panels on both sides for increased visibility. Install signage and reflective safety panels on both sides for increased visibility.

The site will have a single point of normal access with a two-lane sliding gate, two-lane impact-rated barrier arms and traffic light.

Entry Gate:

A dual signal light (red and green) should be installed to control traffic through the gates. The height must measure 145 cm from center of the lower lens to finished roadway. Traffic light housing and pole may be painted black.

Exit Gate:

A free exit loops shall be placed in all exit gate and spaced from the other loops to provide a free rolling exit. Upon activation, the gate shall fully open approximately at the same time a vehicle traveling the site speed limit reaches the gate. Vehicle detection loops shall not be in other traffic paths that would cause nuisance openings by vehicles not departing the site. Install a safe distance from the gate without openings that allow access to wiring. A dual signal light (red and green) should be installed to control traffic through the gates.

Camera Coverage: Pedestals and camera housings may be painted black to match the impact-rated fencing.

Fixed Impact Bollards:

A secure yellow plastic bollard sleeve (post cover) should be installed over each bollard. Bollards should have a minimum outside diameter of at least 15.2 cm and be 1.8 m in length. The maximum distance between bollards should be 1.2 m edge to edge.

Barrier Arms: Barrier arms operational rating shall be appropriate for environmental conditions and duty cycles required for typical site traffic volume. Each barrier arm shall have safety mechanisms such as loops, a pressure pad, or optical sensors, installed to prevent the arm from closing on a vehicle. Distribute reflective tape, red and white striping, evenly across external and internal arm face for increased visibility. Control motors for barrier arm equipment shall be housed in a locked, vandal-resistant enclosure located inside the secure perimeter. Housing installation will include tamper alarms connected to the access control system. A dual signal light (red and green) should be installed to control barrier arm traffic.

4.3. Guardhouse (Security Equipment Control Panel/Enclosure)

A guardhouse is provided to support MIL05B building. It will be located at the facility entrance to process visitors and control entry systems. The guardhouse will operate 24/7 and allow remote control of the facility entrance.

4.4. Grounds

MEP Yard Gates:

House control motors for gate equipment, in a locked, vandal-resistant enclosure located inside the perimeter, secure side of the fence. Fence and gate clearance (when closed) shall be no more than 5 cm. The door release mechanism must be mechanical and provide free egress. Protect door release hardware (egress side) from tampering by the use of a metal shroud around the exit device. The shroud shall not impede use of the exit device by personnel in event of an emergency. Provide padlocks to restrict access to MEP equipment in areas where access to such equipment poses a security or safety risk. Risks include accidental or intentional turning off or altering the settings of equipment essential to data center operations.

Exit device shall always be operable and will immediately retract the latch-allowing egress. Dogging functionality is not allowed.

Gates:

Protect door release hardware (egress side) from tampering by the use of a metal shroud around the egress device. The shroud shall not impede any use of the device by personnel in the event of an emergency. Exit device shall always be operable and will immediately retract the latch-allowing egress. Dogging functionality is not allowed.

Card Reader:

Mount the card reader uniformly at 122 cm above finished floor, as measured from middle of the device, and 13 cm from the doorjamb, unless otherwise specified in the security design. Mount the EDR device at 122 cm above finished floor, as measured from the middle of the device (center of button), unless otherwise specified in the security design. If stacking of EDR under card reader is required, mount EDR device at 94 cm above finished floor, as measured from the middle of the device (center of button). A protective cover shall enclose EDR devices. Opening the cover shall trigger an audible tone in the immediate area. Some AHJ's may not allow a separate cover by code.

Master Key System:

Data center security management requires implementation of an efficient and effective master keying system supporting the concept of least privileged access throughout the data center facility. The master key system design should result in the fewest number of separate cores ideally from a single manufacturer.

4.5. Building Facility

Access control doors will not have relites (windows) or glass inserts, except for the main lobby and office entrances. Door hinges will be installed on the secure side or secured (with a setscrew or welding) to make them tamper-resistant from the non-secure side. Door locks will be keyed to the facility's master key system. For budgeting purposes, most functional areas will be secured with card reader access and video cameras. Exceptions to access control include break rooms, restrooms, conference rooms, janitor closets, and interior nested offices.

Vents or other openings into the building that are below 6 m in height from the surface of the ground shall have secured screen covers installed over the entire opening. If the vent or opening segregates

exterior space with interior space subject to screening requirements upon entry/exit (e.g., Colo), the screen will have a maximum opening no greater than 1.9 cm. Attach screen covers securely to the opening; covers shall require special tools to remove.

4.6. Perimeter Doors

Door hinges should be installed on the secure side of the door or be physically secured (such as with a setscrew or welded) to make them tamper resistant from the non-secure side of the door.
A tamper-resistant key vault, accessible to the fire department, should be installed outside the Fire Riser Room door, flush mounted (recessed into the wall so that the exposed face is even with the surrounding surface) in the building exterior wall. Installation should include a tamper alarm connected to the access control system.
Coordinate the location and mounting (including height) with the AHJ during design.

4.7. Roof Access

All the gates that allow access to the roof should be self-closing, positive latching, key locked with a mortise lock, free egress and storeroom locking function.
Protect door release hardware (egress side) from tampering by the use of a metal shroud around the exit device. The shroud shall not impede any use of the exit device by personnel in the event of an emergency.

4.8. Entry Lobby

Exterior door(s) accessing the lobby from outside will be closed but unlocked to allow personnel to enter the lobby freely. Exterior doors will have a key lock that allows manual securing of the doors (from either side) in an emergency.
Lobby furnishings will be low-profile and arranged to allow clear visibility of all areas by Security Operations Center (SOC) personnel. This includes furniture, plants, screens, displays, and televisions.
A restroom and conference room will be located in the entry lobby to restrict access to more secure areas of the facility. Access from the lobby to the interior will be through a three-door "storefront" system.

4.9. Security Operation Center (SOC)

The SOC will be located adjacent to the building lobby, accessed through a single door from within the secure datacenter. The windows and walls between the lobby and the SOC will be constructed with forced entry-rated materials. The SOC will accommodate up to five people (24/7) and include an office area and a lockable storage room.
Two "deal drawers" will be installed to service lobby visitors. The drawer shall be installed at 86 cm above finished floor and desktop surfaces adjoining the “deal drawer” on either side will be installed flush with this height.
The SOC office door will be flip-turn or push button lockable from the inside and keyed on the outside, with an automatic door closer.

4.10. Administrative Areas

The project includes access control provisions for open offices and the facility operations centre as per the Physical Security Primer for B-Class Facilities. Individual offices, conference rooms, janitor closets, and libraries are designed to be manually lockable. Break rooms will be freely accessible. Single-user restrooms will be lockable from the inside with a flip-turn lock and feature a mechanism to display the occupancy status to those outside. Multiple-stall restrooms will be key-lockable from the outside only. Shower areas will be equipped with a weather-sealed panic button.

4.11. Security Equipment Rooms (SER)

The entry door will be equipped with a card reader for entry and a storeroom function lockset. The walls of the room will be full-height, slab-to-slab construction, and prepared with fire rated plywood backing necessary to support equipment mounting. These rooms will have no carpeting or drop ceilings.

4.12. Loading Dock

The project includes card-in, card-out readers for interior doors separating the Loading Dock from Receiving and exterior personnel doors.
Install a swivelling or wide-angle door viewer (or peephole) in the centre of each exterior personnel door, mounted at 152 cm height above finished floor. Door viewer or peephole shall provide a 180-degree viewing angle.
Roll-up doors will be installed between the facility exterior and the Loading Dock platform. These doors will be metal and solid when closed, with no openings or windows that allow visibility inside. Each loading dock door will have at least one Open/Stop/Close button to control the door. A valid badge read will enable the Open push-button, while Close and Stop buttons will be active, momentary, and available for use at each door at all times. Roll-up doors will have a contact installed on the secured side of the door at floor level, using an armoured cable appropriately secured to the Loading Dock floor to avoid damage by shipping and receiving equipment. The loading dock will also be equipped with a single-person restroom. The lock shall contain a mechanical method that displays the occupancy status of the restroom to those outside.

4.13. Receiving/Staging

Entry doors from the data center corridor into Receiving will be equipped with card-in readers, allowing free egress. A roll-up door will be installed between the Loading Dock and the Receiving area. This door will be metal and solid when closed, with no breaks or windows that allow visibility inside. Each receiving/staging area dock door will have at least one Open/Stop/Close button to control the door. A valid badge read will enable the Open push-button, while Close and Stop buttons will be active, momentary, and available for use at each door at all times. Roll-up doors will have a contact installed on the secured side of the door at floor level, using an armoured cable appropriately secured to the Loading Dock floor to avoid damage by shipping and receiving equipment. Install a hardwired interlock system to prevent simultaneous opening of the roll-up door between the Loading Dock and Receiving and the exterior Loading Dock roll-up doors. The interlock will not allow any of one set of doors to be opened until all the other sets are closed, regardless of the number of roll-up doors in a given set. Secure all Loading Dock and Receiving roll-up doors (manual) chains with padlocks.

4.14. Asset Management

The office will be accessible only from the Receiving Area and feature panoramic windows that provide a clear view of the Loading Dock and Secure Storage. Windows between the office and the Loading Dock should have one-way mirror film that restricts those on the outside from seeing clearly into the office while allowing personnel inside to see out.

4.15. Secure Storage

The entry door from the Receiving area into secure storage will be equipped with card-in, card-out readers and an EDR system.

4.16. High Value Storage:

Entry door into high-value storage will be equipped with card-in, card-out readers and an EDR system.

4.17. Shred Room:

Entry door into the shred room will be equipped with card-in, card-out readers and an EDR system.

4.18. Computer Rooms (Colos)

Anti-Tailgating (ATG): Install floor tape or signage that indicates the detection area boundary on the appropriate side of the door.

5. STRUCTURES – BUILDING WORKS

5.1. Steel structures

Steel structures will have to comply with the Decree of 17 January 2018 *"Update of the Technical Standards for Constructions"*

The Contractor is required to submit, at his own care and expense and with the signature of the designer and his own, before the supply of materials and in time for the examination and approval of the Works Manager: the executive project and the technical report complete with stability calculations, with checks also for the transport and installation phase; the executive design of the foundation works and the support devices of the structure; the welding project, for which the Contractor is obliged to avail himself, at his own expense, of the advice of the Italian Institute of Welding (1.1.5), or of the Italian Naval Register (R.I.N.A.), with the drafting of a specific report to be attached to the project.

Steel structural elements

The Contractor must communicate in writing to the Works Manager, before procurement, the origin of the materials, in such a way as to allow checks, even in the processing workshop, in accordance with the provisions of the Technical Standards for Construction, approved by Ministerial Decree of 17 January 2018, UNI standards and other standards that may affect the project materials.

The Works Manager reserves the right to have a pre-assembly carried out in the workshop for those structures or parts of them that he deems appropriate, proceeding with the provisional acceptance of the materials within 10 days from the Contractor's communication of completion of the various elements.

Before the final testing, the Contractor must submit a report from the I.I.S. (or R.I.N.A.) which ascertains the checks carried out during the work on the welds and the related methods and equipment.
During the various phases, from loading, to transport, unloading, storage, lifting and assembly, the utmost care must be taken to ensure that the stress values, both general and local, induced by the various operations are not exceeded compared to those verified in the project for each individual phase, to avoid deformations that could complicate the final installation operations. Particular precautions will be taken to avoid deformation effects due to contact with ropes and lifting equipment. The counter-arrows to be applied to truss structures must be made according to the design tolerances.
The holes that are offset must be reamed, and if the diameter of the hole is also greater than the tolerance referred to in the NTC 2018, care will be taken to use a bolt with a larger diameter. In connections where friction contributes to the calculation strength of the structural element, white metal blasting is prescribed no more than two hours before joining. In bolted joints, the Contractor will carry out a tightening check on 10% of the number of bolts in the presence of the Works Manager.
Painting
All steel structures must be protected against corrosion by means of a painting cycle, after mechanical brushing or sandblasting of all surfaces, until all oxidized parts are eliminated. A coating cycle will consist of a minium of three layers of one- or two-component hardening paint products for chemical filming and physical filming.

5.1.1. Bearings

The design of the support devices must comply with the "Instructions for the calculation and use of support devices to be supplied in constructions" C.N.R.-UNI 10018-72, and must contain: the calculation of excursions and rotations, indicating an appropriate safety clearance, and separately showing the contribution due to permanent and accidental loads, thermal variations, viscous deformations and shrinkage of concrete; the static verification of the individual elements and the indication of the materials, with reference to the UNI standards, as well as the constraint reactions that the device will have to withstand.
All the materials to be used must be accepted before the work by the Works Manager, who may also carry out checks in the workshop.
Before installation, the Contractor must trace the reference axes and the leveling of the support surfaces, rectifying the differences with cement mortar with epoxy resin additives.
Visible fasteners.
All visible fasteners (bolts, nuts, washers, threaded bushings, etc.) must be made of stainless steel.

5.2. Reinforced concrete works

5.3. Normal and prestressed reinforced concrete works

In the execution of normal and prestressed reinforced concrete works, the Contractor must strictly comply with all the standards contained in the NTC 2018 and all the regulations in force.
For works in seismic areas, the Contractor must comply with the requirements indicated in the 2018 Technical Construction Standards and the latest regulations in force

All reinforced concrete works that are part of the contracted work will be carried out on the basis of stability calculations, accompanied by executive drawings and a report, which must be drawn up and signed by a specialist engineer, and which the Contractor must submit to the Works Management within the deadline that will be prescribed to him, in accordance with the diagrams and drawings that are part of the project and attached to the contract or the rules that will be given to him, at his request, at the time of delivery of the works.
The examination and verification by the Works Management of the projects of the various reinforced concrete structures does not in any way exempt the Contractor from the responsibilities deriving from him by law and for the precise agreements of the contract, it being contractually established that, despite the checks of any kind carried out by the Works Management in the exclusive interest of the Administration, the Contractor himself remains solely and completely responsible for the works, both in terms of their design and calculation, and in terms of the quality of the materials and their execution; consequently he will have to answer for any inconveniences that may occur, of whatever nature, importance and consequence they may result.
Once the dismantling has taken place, the surface of the works will be regularized with cement mortar. The application will be done after cleaning and washing the surface of the castings and the mortar must be well balanced with trowel and trowel, with the addition of appropriate dusting of pure cement.
If the characteristic strength of the specimens subjected to tests in the laboratories is lower than the design value, the Works Manager may, at his sole discretion, order the suspension of the castings of the work concerned and proceed, at the Contractor's expense, to a theoretical and/or experimental control of the structure affected by the quantity of deficient concrete, on the basis of the reduced strength, or to a verification of the resistance with complementary tests, or with the taking of specimens for coring directly from the structures, or with other tools and methods to the satisfaction of the Works Management. These checks will be the subject of a specific report in which it is demonstrated that, without prejudice to the hypotheses of constraint and load of the structures, the characteristic strength is still compatible with the design stresses, according to the intended use of the work and in accordance with the laws in force.
If this report is approved by the Works Manager, the concrete will be accounted for on the basis of the value of the resulting characteristic strength.
If this resistance is not compatible with the design stresses, the Contractor will be required, at his own expense, to demolish and rebuild the work or to adopt those measures that the Works Management will formally approve.
No indemnity or compensation will be due to the Contractor if the value of the characteristic strength of the concrete is greater than expected.
In addition to the checks relating to the characteristic strength referred to above, the Works Manager may, at his sole discretion and at the complete expense of the Contractor, order all the tests he deems necessary, and in particular the following:

- Test of the cone referred to in the App. E of UNI 7163-79;
- Cement dosage test in accordance with UNI 6393-72 and UNI 6394-69;
- Air content test according to UNI 6395-72;
- Water content test;
- Homogeneity test in case of transport by truck mixer;

- Compressive strength test on cylindrical samples taken by coring from already seasoned structures;
- Compressive strength test with a hammer.

5.4. Binders, aggregates, formwork, reinforcements, additives for reinforced concrete works

Binders - In the works in question, only hydraulic binders defined as cements by the provisions in force on the subject must be used.
All cement supplies must have adequate certifications attesting to quality, origin and must be in perfect condition; periodic tests and checks must be carried out and the materials must be stored in suitable places.
All the characteristics of the materials must comply with current legislation and any additional requirements provided by the project or by the works management.
The cements will be of the following type:

- Normal and high-strength cements;
- Aluminous cements;
- Cements for retaining barriers.

Normal and high-strength cements will have a start of setting after 45' from mixing, setting end after 12 hours and resistance to compression and bending variable depending on the type of cement used and the quantities and ratios of mix.
Aluminous cements will have a set start after 30 minutes from the mix, a set end after 10 hours and resistances similar to normal cements.
Cements for retaining barriers will have a setting start after 45' from the mix, a setting end after 12 hours and maximum strengths (after 90 days) of 34 N/sq mm. (350 Kg/sq cm).
Inert materials - The aggregates can be natural or crushed and will be made up of non-friable, non-freezing elements and free of organic, clayey or gypsum substances; they will be classified according to the maximum size of the largest element.
All characteristics, origin and grain size will be subject to the prior approval of the works management.
The particle size curve must be studied in such a way as to obtain the workability required of the mixtures, in relation to the type of use and the maximum compactness necessary to obtain the indicated strengths.
Sand - The sand to be used in mortars and concretes must not contain organic substances, must be of siliceous, quartz, granite or limestone quality, have a homogeneous grain size and come from the crushing of rocks with high compressive strength; the weight loss, at the settling test, must not exceed 2%.
Water - It must be fresh, clear, free of earthy or organic substances, free of salts (in particular chlorides and sulphates) and non-aggressive with a pH between 6 and 8 and a turbidity not exceeding 2%, the water used in cementitious mixtures must not have traces of salts in harmful percentages, in particular sulphates and chlorides in concentrations greater than 0.5%. It is strictly forbidden to use seawater for reinforced concrete and for structures with metallic materials subject to corrosion.

Formwork - Formwork, of any type, must have limited deformations (consistent with the tolerances required for the products), have such rigidity as to avoid strong amplitudes of vibration during compaction, avoiding dimensional variations of the surfaces of the individual formworks which must also be carefully cleaned from dust or any other foreign material, either directly or by means of air jets, water or steam.
For castings on surfaces with a horizontal inclination greater than 30°C, the formwork (or a sufficient net to hold the concrete in shape) must be provided.
In the areas of the formworks where the formation of air bubbles is expected, given their particular positioning or conformation, holes or devices must be provided to allow them to escape.
Before casting, checks will be carried out on the prepared formwork on stability, dimensions, the application of the release agent, the laying of reinforcements and inserts; More accurate checks must be carried out, always before casting, to check the props (which must never rest on frozen ground), for the execution of the joints, fixings and connections of the formwork.
The formwork will be made of wood, plastic, concrete and metal.
Wooden formwork (boards) - They will consist of boards with a thickness of not less than 25 mm, of standard width, free from knots or worms and taking care that the direction of the fibers does not deviate from the longitudinal direction of the board.
The assembly of the boards will be carried out with joints, between one and the other, of 1/3mm (for expansion) from which the mixture must not come out; to avoid breaking the edges, triangular section strips must be provided suitably arranged inside the formwork.
The number of re-uses envisaged is 4 or 5.
Wooden formwork (panels) - Panels with a thickness of not less than 12 mm will be used, with the fibers of the outer layers arranged in the load-bearing direction, with adequate resistance to impact and abrasion.
The number of re-uses to be expected is about 20.
Storage (boards or panels) - The timber must be placed in stacks on supports with a height from the ground such as to allow sufficient ventilation without introducing deformations due to the distances of the supports.
The stacks must be placed in places protected from atmospheric agents and protected with waterproof sheets; The cleaning of the timber (extraction of nails, scraping of mortar residues, etc.) must take place immediately after stripping and, in any case, before stacking or subsequent use.
Plastic formwork - They will be used to obtain particularly smooth surfaces, they must not be used for outdoor casting; extreme attention must be paid to the preparation of the internal surfaces of the formwork, avoiding excessive hardness and smoothing of the same (to prevent the formation of cobwebs and the like due to the effect of the vibration of the mixture).
The sealing material of the joints must be compatible with that of the formwork; the number of re-uses to be expected is 50/60.
Concrete formwork - They will comply with the current regulations for reinforced concrete and will have a strength of not less than 29 N/sq mm (300 Kg/sq cm.), any metal inserts (excluding welding plates) must be made of stainless steel.
The handling and storage of these formworks must be carried out with particular care, the storage must take place indoors, the welding operations must not damage the adjacent surfaces, the vibration will be carried out only with external vibrators and the scraping and cleaning operations of the formwork must be completed before the concrete is set.
The number of reuses to be provided for these formworks is about 100.

Metal formwork - In the case of formwork made of light metals (aluminium or magnesium), suitable alloys must be used to avoid corrosion due to wet concrete; particular attention will be paid to the possible formation of galvanic pairs deriving from contact with different metals in the presence of fresh concrete.
In the case of formwork made of flat or shaped steel sheets, appropriate stiffeners must be used, and different treatments of the internal surface (polished, sandblasted or raw rolling sheet) with the following number of reuses:

- Polished sheet metal 2
- Sandblasted sheet metal 10
- Raw rolling sheet over 10.

These formworks may consist of assembled panels or fixed systems specifically for the works to be carried out (tilting tables, batteries, etc.), the selection criteria will be linked to the number of reuses envisaged, the tightness of the joints, tolerances, deformations, ease of assembly and safety standards required by current legislation.
Armor - In addition to complying with current standards, the reinforcements must not be oxidized or subject to defects and deterioration phenomena of any kind.
Steels for reinforced concrete - These steels must be free from defects that may affect adhesion with the conglomerate and will comply with the regulations in force for the execution of normal and prestressed reinforced concrete works and metal structures.
The same requirements also apply to steels in smooth or ribbed wires, electro-welded meshes and strands for prestressed concrete.
Steels for metal structures - They must comply with the standard mentioned in the previous point and have the specific characteristics for steels for welded structures, for castings and for bolts and fixing plates.
Additives - All additives to be used for concretes and mortars (aerating agents, accelerators, fluidizers, etc.) must comply with the specific regulations and any requirements set.
They must also be used in quantities (less than 2% of the weight of the binder), according to the indications of the manufacturers; preliminary tests may be carried out to verify the various types of materials and their characteristics.
Retardant additives - These are those that vary the initial speed of the reactions between the water and the binder, increasing the time necessary to pass from the plastic to the rigid state without changing the mechanical resistance; they will consist of mixtures of various types to be used according to the indicated prescriptions. The use of gypsum or its compounds is not permitted.
Accelerating additives - These are those that increase the speed of reactions between water and the binder, accelerating the development of resistance; they will consist of calcium chloride compounds or similar in quantities varying from 0.5 to 2% of the weight of the cement, in accordance with the specifications of the manufacturers, avoiding lower quantities (which lead to an inverse effect) or higher quantities (which lead to excessive shrinkage). The use of soda is not allowed.
Fluidizing additives - They reduce the forces of attraction between the binder particles, increase the fluidity of the mixtures and lead to a reduction in water quantities in the order of 10%; they will be mandatory for pumped concrete, for castings in narrow formwork or in the presence of high reinforcement density.

Dye additives - The dyes used for concrete are generally made up of oxides and must have requirements of resistance to alkalis, light, colouring capacity, lack of water-soluble salts; the following are generally used:

- Yellow: yellow iron oxide, cadmium yellow, etc.
- Red: red iron oxide, red ochre;
- Blue: light blue manganese, light blue cobalt, etc.
- Grey: grey chromium oxide, chromium hydroxide, etc.
- Brown: sienna, brown oxide;
- Black: black iron oxide;
- White: limestone, titanium oxide.

Release agents - The surfaces of the formworks must always be treated beforehand by applying release agents that must be applicable in hot or cold climates, must not stain the concrete or attack the cement, will avoid the formation of air bubbles, and must not affect subsequent surface treatments; they may be in emulsions, mineral oils, mixtures and waxes.
The methods of application of these products must comply with the indications of the manufacturers or with the specific requirements set; In any case, the application will be carried out before laying the reinforcements, in thin layers and in a uniform manner. The application of release agent to the reinforcements must be carefully avoided.
Mixtures - The particle size distribution of the aggregates, the type of cement and the consistency of the mixture must be adapted to the particular destination of the casting and the installation process of the conglomerate.
The use of additives must be carried out on the basis of checks on their quality, aggressiveness and effective compliance with the required requirements.
The quantity must be the minimum necessary, in relation to the correct water-cement ratio and also considering the quantities of water present in the aggregates; The mixture obtained must therefore meet the necessary workability and the final resistance characteristics required by the prescriptions.
The mixing will be carried out with suitable concrete batching plants and such as to guarantee effective control over the dosage of the various materials; The plant must also be subjected to periodic checks of the measuring instruments which may also be verified, at the request of the Works Management, by the relevant authorized offices.
Sampling - Throughout the phase of the concrete castings, normal or reinforced, planned for the work, the works management will have samples taken from the mixtures used at the site of execution in the quantities and in the manner provided for by current legislation, arranging the relevant procedures for carrying out the tests to be carried out and the official laboratory to which this task is to be entrusted.
Fair face finish – particular attention and care must be paid to the creation of products with a fair face finish, the joints must have perfect straightness and modularity, in accordance with the indications of the DL.
Laying of the conglomerate
Transport - The transport of the mixtures from the place of preparation to the place of use must be carried out with suitable mechanically lifted containers (for very limited distances) or on concrete mixers equipped with rotating containers.

The time required for transport and any stop before casting must not exceed the maximum time allowed to ensure a homogeneous and quality casting; in ordinary concrete this maximum time will be 45/60 minutes and, in the case of preheated concrete, 15/30 minutes.
The minimum mixing time must be about 5 minutes, or 30 turns of the rotating container.
Formwork control - Before casting, the formwork, reinforcement and any inserts will be carefully checked and alignments, positions, internal and bottom cleaning will be checked.
Casting of the conglomerate - Before unloading operations, checks must be carried out on the actual conditions of workability which must comply with the requirements laid down for the various types of casting.
During unloading, precautions must be taken to avoid segregation in the mixtures.
The casting will be carried out by reducing the fall height of the conglomerate as much as possible and avoiding any impact against the walls of the formwork or other obstacles; it will therefore be necessary to proceed by casting, uniformly, in horizontal layers not exceeding 40 cm, vibrating, at the same time as the casting proceeds, the parts already made.
The casting must be carried out with mixture temperatures between 5 and 30°C and with all the precautions required by the works management according to the climatic conditions.
Resumption of the casting - The casting must be carried out uniformly and continuously; in the event of interruption and subsequent resumption, this cannot take place after a time exceeding (depending on the outside temperature) 2 hours at 35°C or 6 hours at 5°C.
If the shooting times exceed these limits, the recovery areas must be treated with special mortars and precautions indicated by the works management.
Vibration - The vibration will have as its purpose the compaction of the material and can be

- Indoor (Immersion)
- External (on formwork)
- On table
- Surface.

Immersion vibration will be performed with tube or blade vibrators according to the size and type of formwork used for the casting.
The number and diameter of vibrators will be established according to the following table:

Diam. needle	25 mm.	Capacity	1/3 mc/h
"	35/50 mm.	"	5/10 mc/h
"	50/75 mm.	"	10/20 mc/h
"	100/150 mm.	"	25/50 mc/h

In addition, vibrators with a vibration amplitude greater than 1 mm and a frequency between 10,000 and 12,000 cycles per minute must be used.
The vibration frequency must be chosen in relation to the type of grain size used according to the following indicative table:

Diam. inert	6.0 cm	frequency	1,500 c.p.m.
"	1.5 cm.	"	3,000 c.p.m.
"	0.6 cm.	"	6,000 c.p.m.
"	0.2 cm.	"	12,000 c.p.m.

Fine and cement " 20,000 c.p.m.

The following requirements must also be observed when performing the vibration:
The casting will be carried out in uniform layers with a thickness not exceeding 30/40 cm;

- The vibrator will be inserted into the jet vertically at intervals established by the works management;
- The vibration must affect the previous layer for at least 10/15 cm;
- The vibrators must be immersed and withdrawn from the jet at an average speed of 10 cm/sec.;
- The vibration time will be between 5/15 seconds;
- The vibration will be suspended at the appearance, on the surface, of a layer of mortar rich in water;
- The use of vibrators to remove concrete is prohibited;

The utmost care must be taken to avoid touching the reinforcements prepared in the formwork with the vibrating needle.

- The external vibration will be achieved by the application, outside the formwork, of vibrators with frequencies between 3,000 and 14,000 cycles per minute and distributed in an appropriate way.
- The vibration on the table will be carried out for the production of prefabricated products by means of vibrating tables with frequencies between 3,000 and 4,500 c.p.m.
- The surface vibrators will be used, in accordance with the requirements of the works management, on layers of conglomerate not exceeding 15 cm.

Unless otherwise specified, the vibration of concrete with light aggregates is not permitted.
Maturation - Normal maturation at room temperature will be carried out in compliance with the ordinary precautions and any additional prescriptions provided by the works management.
In the case of the use of steam curing systems of the mix, the following requirements must be observed in the various phases of preheating, heating and cooling:
Preheating - Preheating may, if required, be carried out:

- With steam jets in the concrete mixer;
- With an increase in the temperature of the mixture materials.

In both cases, the formwork will also be heated whose temperature, in the case of normal concrete, must not be higher than 5/10°C than that of the mixture; For concretes lightened with expanded clay, the temperature of the formwork must not exceed that of the mixture.
During preheating, for concrete with a temperature of 30°C, aggregates with temperatures above 50°C and water with a temperature above 80°C must not be used; the casting time must not exceed 40 minutes.
The preheating phase can also be carried out with pre-maturation (long cycle) of 3 hours and concrete temperature not less than 15°C.
Heating - The heating phase can be adopted for doughs at room temperature or already preheated. In the case of concrete at room temperature, a long heating cycle must be used with a temperature gradient not exceeding 20/25°C/h.

Concretes preheated in a long cycle with mixing temperatures of 30°C may be subjected to heating with a thermal gradient not exceeding 30/35°C/h.
During all the preheating and heating phases, a suitable level of humidity must be maintained in the environment and in the products and there must be no temperature fluctuations.
Cooling - Cooling will be carried out with a thermal gradient of 20/25°C/h until a concrete temperature is reached that has a difference, more or less, of no more than 15°C compared to the outside temperature.
Dismantling - For the times and methods of dismantling, all the requirements provided for by current legislation and any specifications provided by the works management must be observed; in any case, stripping must take place gradually, avoiding introducing dynamic actions into the concrete and will be carried out after the strength of the conglomerate has reached the required value.
Steel - All steel materials used for the construction of reinforced concrete or metal structures must have characteristics that comply with the requirements of current legislation, certified by suitable accompanying documents and confirmed by any tests carried out by the works management at approved laboratories.
All metal reinforcements must be cut to size, shaped and installed including iron wire bindings, spacers, any challenges, overlaps even if not clearly expressed in the executive drawings but required by current legislation.

5.5. Laying of the conglomerate

Transport - The transport of the mixtures from the place of preparation to the place of use must be carried out with suitable mechanically lifted containers (for very limited distances) or on concrete mixers equipped with rotating containers.
The time required for transport and any stop before casting must not exceed the maximum time allowed to ensure a homogeneous and quality casting; in ordinary concrete this maximum time will be 45/60 minutes and, in the case of preheated concrete, 15/30 minutes.
The minimum mixing time must be about 5 minutes, or 30 turns of the rotating container.
Formwork control - Before casting, the formwork, reinforcement and any inserts will be carefully checked and alignments, positions, internal and bottom cleaning will be checked.
Casting of the conglomerate - Before unloading operations, checks must be carried out on the actual conditions of workability which must comply with the requirements laid down for the various types of casting.
During unloading, precautions must be taken to avoid segregation in the mixtures.
The casting will be carried out by reducing the fall height of the conglomerate as much as possible and avoiding any impact against the walls of the formwork or other obstacles; it will therefore be necessary to proceed by casting, uniformly, in horizontal layers not exceeding 40 cm, vibrating, at the same time as the casting proceeds, the parts already made.
The casting must be carried out with mixture temperatures between 5 and 30°C and with all the precautions required by the works management according to the climatic conditions.
Resumption of the casting - The casting must be carried out uniformly and continuously; in the event of interruption and subsequent resumption, this cannot take place after a time exceeding (depending on the outside temperature) 2 hours at 35°C or 6 hours at 5°C.
If the shooting times exceed these limits, the recovery areas must be treated with special mortars and precautions indicated by the works management.

Vibration - The vibration will have as its purpose the compaction of the material and can be

- Indoor (Immersion)
- External (on formwork)
- On table
- Surface.

Immersion vibration will be performed with tube or blade vibrators according to the size and type of formwork used for the casting.
The number and diameter of vibrators will be established according to the following table:

Diam. needle	25 mm.	Capacity	1/3 mc/h
"	35/50 mm.	"	5/10 mc/h
"	50/75 mm.	"	10/20 mc/h
"	100/150 mm.	"	25/50 mc/h

In addition, vibrators with a vibration amplitude greater than 1 mm and a frequency between 10,000 and 12,000 cycles per minute must be used.
The vibration frequency must be chosen in relation to the type of grain size used according to the following indicative table:

Diam. inert	6.0 cm	frequency	1,500 c.p.m.
"	1.5 cm.	"	3,000 c.p.m.
"	0.6 cm.	"	6,000 c.p.m.
"	0.2 cm.	"	12,000 c.p.m.
Fine and cement		"	20,000 c.p.m.

The following requirements must also be observed when performing the vibration:
The casting will be carried out in uniform layers with a thickness not exceeding 30/40 cm;

- The vibrator will be inserted into the jet vertically at intervals established by the works management;
- The vibration must affect the previous layer for at least 10/15 cm;
- The vibrators must be immersed and withdrawn from the jet at an average speed of 10 cm/sec.;
- The vibration time will be between 5/15 seconds;
- The vibration will be suspended at the appearance, on the surface, of a layer of mortar rich in water;
- The use of vibrators to remove concrete is prohibited;

The utmost care must be taken to avoid touching the reinforcements prepared in the formwork with the vibrating needle.

- The external vibration will be achieved by the application, outside the formwork, of vibrators with frequencies between 3,000 and 14,000 cycles per minute and distributed in an appropriate way.

- The vibration on the table will be carried out for the production of prefabricated products by means of vibrating tables with frequencies between 3,000 and 4,500 c.p.m.
- The surface vibrators will be used, in accordance with the requirements of the works management, on layers of conglomerate not exceeding 15 cm.

Unless otherwise specified, the vibration of concrete with light aggregates is not permitted.
Maturation - Normal maturation at room temperature will be carried out in compliance with the ordinary precautions and any additional prescriptions provided by the works management.
In the case of the use of steam curing systems of the mix, the following requirements must be observed in the various phases of preheating, heating and cooling:
Preheating - Preheating may, if required, be carried out:

- With steam jets in the concrete mixer;
- With an increase in the temperature of the mixture materials.

In both cases, the formwork will also be heated whose temperature, in the case of normal concrete, must not be higher than 5/10°C than that of the mixture; For concretes lightened with expanded clay, the temperature of the formwork must not exceed that of the mixture.
During preheating, for concrete with a temperature of 30°C, aggregates with temperatures above 50°C and water with a temperature above 80°C must not be used; the casting time must not exceed 40 minutes.
The preheating phase can also be carried out with pre-maturation (long cycle) of 3 hours and concrete temperature not less than 15°C.
Heating - The heating phase can be adopted for doughs at room temperature or already preheated.
In the case of concrete at room temperature, a long heating cycle must be used with a temperature gradient not exceeding 20/25°C/h.
Concretes preheated in a long cycle with mixing temperatures of 30°C may be subjected to heating with a thermal gradient not exceeding 30/35°C/h.
During all the preheating and heating phases, a suitable level of humidity must be maintained in the environment and in the products and there must be no temperature fluctuations.
Cooling - Cooling will be carried out with a thermal gradient of 20/25°C/h until a concrete temperature is reached that has a difference, more or less, of no more than 15°C compared to the outside temperature.
Dismantling - For the times and methods of dismantling, all the requirements provided for by current legislation and any specifications provided by the works management must be observed; in any case, stripping must take place gradually, avoiding introducing dynamic actions into the concrete and will be carried out after the strength of the conglomerate has reached the required value.
Steel - All steel materials used for the construction of reinforced concrete or metal structures must have characteristics that comply with the requirements of current legislation, certified by suitable accompanying documents and confirmed by any tests carried out by the works management at approved laboratories.
All metal reinforcements must be cut to size, shaped and installed including iron wire bindings, spacers, any challenges, overlaps even if not clearly expressed in the executive drawings but required by current legislation.

5.6. Ceilings and false ceilings

5.7. Floors

The roofing of the rooms and rooms may be carried out, according to the orders of the Works Management, with floors of one of the types described below.
The Works Supervision has the right to prescribe the system and type of floor of each room and for each type of floor it will also establish the accidental overload to be considered and the Contractor must without exception follow the prescriptions of the Works Management.
The Contractor shall ensure that the lower face of all floors is solidly secured with iron hooks and lamphangers in the number, shape and position which, at his request, will be specified by the Works Management.
Reinforced concrete floors. – The mixed concrete and brick slab cast on site must be made with pots of any type interposed with parallel ribs in cement conglomerate made in compliance with current regulations and the overloads provided. A reinforced concrete slab must be superimposed on this structure and the installation of the floor must also include the possible formation of dividing ribs and joists for the support of overlying partitions, including the perimeter band full of stiffening.
The assembly of the floor must include the preparation of formwork, temporary and support reinforcements, scaffolding and protective structures, subsequent stripping and the required samples and static tests.
In the case of residential premises, it is mandatory to build a floor for the first level starting from the foundation soil, which must be carried out in the same way as the intermediate floors and will be detached from the ground by at least cm. 50.
Floor with prefabricated joists - The flat floor in reinforced concrete and bricks made of prefabricated joists must comply with all the technical-construction characteristics indicated for the cast-in-situ floor and will consist of wholly or partially prefabricated joists to replace the traditional ones.
These joists must be equipped with the relevant test certificates prepared by the manufacturers and, in the case of partial prefabrication, they will be integrated with additional reinforcements prescribed by the executive drawings.
The upper slab will be cast on site after the completion of the assembly of the slab and the preparation of the required reinforcement.
The assembly of the floor will include the preparation of temporary and support reinforcements, scaffolding and protective structures, the subsequent stripping and the required samples and static tests.
Flat floor in prefabricated panels - The panel floor will be made with prefabricated panels off-site and subsequently assembled on site in the positions and quantities provided for according to the requirements established by the technical specifications.
The panels and their construction methods must comply with current legislation, including the relevant certification on the characteristics of the materials used and the panel in its entirety.
The assembly will include the preparation of the temporary and support reinforcements, scaffolding and protective structures, the subsequent stripping and the required samples and static tests.
In the case of panels intended for supplementary castings, the prescribed pots or lightening must be prepared only after completing the shoring operations; in the case of complete panels, they must be installed according to the indications of the executive drawings.
Solid cast slab in reinforced concrete or prestressed concrete - For this type of slabs, the requirements set out in the regulations in force and, in particular, in the technical standards for the execution of works in normal and prestressed reinforced concrete, which are periodically updated, apply.

Mixed floors in reinforced concrete or prestressed concrete and hollow blocks in brick or other materials - The brick blocks can be lightened only or have a static function in collaboration with the conglomerate. In both cases, the profile of the blocks, which delimit the rib of the concrete to be cast, must not obstruct the flow of the concrete or reduce the section provided for the ribs.
In the case of blocks with a collaborative function, continuity in the transmission of efforts between the various elements must be ensured; any completion slabs must achieve the total solidarization of the various parts.
In the case of blocks made of materials other than brick (expanded clay, plastics, etc.), these must have characteristics that meet the requirements both in the case of use as collaborating blocks and as non-collaborating parts of the structure. For these materials, unless otherwise specified, the specifications already indicated will apply.
Floor with prefabricated elements and completion castings - In addition to the above requirements, these structures must guarantee transversal connections between the various slab strips and will have dimensions that comply with the provisions of current legislation; the relative completion castings must have a cross-mesh distribution reinforcement.

5.8. Suspended ceilings

All the false ceilings provided, regardless of the construction system, must have horizontal surfaces or in any case meet the requirements, be free of undulations, cracks or defects and perfectly aligned. The installation will be carried out with suitable tools and in accordance with the recommendations of the manufacturers, it will also include all the work necessary for the insertion of lighting fixtures, air conditioning grids, fire prevention and anything else required for the perfect functionality of all the systems present in the work to be carried out.
If it is necessary to use the false ceiling for the construction of hanging bodies (lighting fixtures, signage, etc.), adequate reinforcements of the load-bearing structure of the false ceiling slabs will be carried out at the expense of the Contractor through the use of additional tie rods; These tie rods must be fixed, in accordance with the requests of the Works Management, in structural sealing points and with anchoring systems that guarantee the necessary stability.
The systems for creating false ceilings can be:
False ceiling in plaster and plasterboard - They will have thicknesses and dimensions such as to introduce bending deformations (on stresses originating from their own weight) not exceeding 2mm.; they will consist of reinforced gypsum-based mixtures and will be mounted on guides or fixed to concealed structures; this type of false ceilings must be made with removable gypsum panels to be anchored to the pre-existing structure with a galvanized iron wire reinforcement and metal frames arranged according to a predetermined framework to which the panels themselves will be fixed.
In the case of plasterboard, the false ceiling must be suspended, closed, consisting of prefabricated sheets of cardboard gypsum with a thickness of mm. 12.5 fixed by means of phosphated self-drilling screws to a structure made up of galvanized steel sheet profiles 6/10 thick installed with a center distance of approx. 60 cm and finishing of the joints carried out with bands of paper and special glue in addition to the sealing of self-drilling screws.
Mineral fiber tile ceilings provide solutions for every acoustic need, from high sound absorption to high sound attenuation or the balance of both.

5.9. NIM01 – Prefabricated monobloc building for external guardhouse

Supply and installation of a single monobloc prefabricated building in reinforced concrete (vibrated reinforced concrete) for external security guardhouse, type Santerno Prefabricated Favignana 700 model (code PGF700), to be submitted to the approval of the D.L.
Prefabricated rectangular plan with internal dimensions:
Main room: 308+676x226cm
Bathroom: 110x124cm
Technical shaft: 210x84cm
Internal dimensions: 676x226x H 240cm

STRUCTURE: Monobloc in vibrated reinforced concrete with a linear and uniform thickness of 12 cm external and 7 cm internal.
The walls will be assembled together using a metal coupling system, equipped with door compartments and ventilation grilles as per the project.
The external surfaces are smooth at the bottom of the metal formwork while the internal ones are leveled, ready for painting.
Sealing of the connections between the prefabricated elements, carried out with acrylic sealant.

SEISMIC PARAMETERS
Rated Life: 50 Years
Soil Category: D
Use class: 2

The roof is composed of prefabricated elements of variable thickness depending on the slopes, spans and loads and overloads of the project.
Normally an extra load of 400 kg/sqm is provided.
The individual elements, with a fixed projection of 16cm, except for special needs, are equipped with a perimeter joint and drip tray and are tied to the walls by means of dry metal inserts.
Vibrated reinforced concrete roof slab without perimeter protrusion, flat type, minimum thickness 10 cm and waterproofed with bitumen and glass fiber-based sheathing.
Rainwater watershed with collection of the same in collection outlets.

EXTERNAL FINISHES: External finish made with two coats of quartz paint, after passing a solvent-based insulating layer diluted in RAL color chosen by the D.L. to be sampled for approval.
Metal perimeter flashing.

FIXTURES AND WINDOWS: n. 1 hinged access door dimensions 80x215cm with electric lock for card-reader; n. 1 access door to the technical hinged aluminum shaft dimensions 70x215cm equipped with external/internal handle, lock with key and automatic reclosing device; n. 1 internal aluminum door dimensions 70x215cm; n. 1 window with shatterproof glass dimensions 100x120cm, swing-swing opening; n. 3 windows with shatterproof glass dimensions 180x120cm fixed upper opening and lower paper pass; n. 1 window with shatterproof and shielded glass dimensions 90x120cm, swing-swing opening.

FINISHES AND ACCESSORIES MAIN ROOM: The internal walls of the concierge room finished with two coats of white paint, after passing a layer of diluted solvent-based insulation.

The floor is covered with dark gray stoneware tiles with a non-slip bush-hammered external finish, dimensions 33x33cm.
Main room: 1 ceiling light controlled by a switch and three two-pass sockets are provided. The lamps will be LED with a 60x60cm (500 LUX) screen.

FINISHES AND ACCESSORIES IN THE ANTEROOM ROOM: The internal walls of the bathroom will be covered in light grey stoneware in the 33x33cm size at full height.
The floor is covered with dark gray stoneware tiles with a non-slip bush-hammered external finish, dimensions 33x33cm.

FINISHES AND ACCESSORIES TOILET ROOM: The internal walls of the bathroom will be covered in light gray stoneware size 33x33cm at full height.
The floor is covered with dark gray stoneware tiles with a non-slip bush-hammered external finish, dimensions 33x33cm.
Toilet room: lamp with presence sensor and a two-pass socket provided.
N.1 Wall-hung toilet complete with rinsing device with external backpack cistern.
N.1 Toilet paper dispenser, Jumbo Roll type, external manual in plastic.
N.1 Infrared radiant panel.
N.1 Corner hand wash.
N.1 Steel mirror.
N.1 Battery operated soap dispenser.
N.1 Eco-jet electric towel.

SYSTEMS: Distribution switchboard complete with external differential circuit breaker with eight places.
Boxes with sockets placed in the other rooms.
Instantaneous boiler with adequate flow rate.
Predisposition with floor cable entry (can be used for the passage of electrical and data line cables).
The system is made with flexible and/or rigid pipes of the type with high resistance to crushing, partially embedded in the concrete casting and not visible.
The electrical system will be built according to the provisions dictated by the customer.

<u>COMPOSITION OF THE ELECTRICAL PANEL</u>
Composition Distribution Board: "DBC-GH. A-0-1" with two sections (normal and UPS).
Technical Specification (IP55, Icc=10kA, Rated operational voltage =400V).
Normal Section:
n°1 Disconn. Switch 4P for "Main Switch (to be defined according to the electrical power in Distribution Board)
n°1 circuit breaker for auxiliary 24V
n°1 circuit breaker for auxiliary 230V
n°1 Multimeter; n°1 Voltage presence
n°1 Surge Protection Device
n°2 MCB 2P 10A + RCD 25A, 30mA type A for lighting system
n°3 MCB 2P 16A + RCD 25A, 30mA type A for small power in guardhouse
n°1 MCB 2P 16A for Data Rack

n°1 MCB 2P 16A + RCD 25A, 30mA type A for Intercom System
n°1 MCB switch for MVHR for air change inside the guardhouse (to be defined according to MVHR requirements)
n°1 MCB+RCD switch for Cooling/heating DX Unit (to be defined according to DX Unit)
n°1 MCB+RCD 2P for electric boiler (to be defined according to Boiler)
n° 3 MCB 2P 16A + RCD 25A, 30mA type A for "Spare"
n°1 MCB 2P 32A for "Spare"
n° 2 MCB 4P 16A + RCD 25A, 30mA type A for "Spare" UPS Section
n°1 Disconn. Switch 4P for "Main Switch (to be defined according to the electrical power in Distribution Board)
n°1 circuit breaker for auxiliary 24V
n°1 circuit breaker for auxiliary 230V
n°1 Multimeter;
n°1 Voltage presence
n°1 Surge Protection Device
n°1 MCB 2P 16A for Data Rack
n°1 MCB 2P 16A + RCD 25A, 30mA type A for "DB SEC PANEL"
n°3 MCB 2P 16A + RCD 25A, 30mA type A for gate (and turnstile, if present)
n°1 MCB 2P 16A + RCD 25A, 30mA type A for Access barrier
n° 2 MCB 2P 16A + RCD 25A, 30mA type A for "Spare"
n° 1 MCB 2P 32A + RCD 40A, 30mA type A for "Spare"
n° 2 MCB 4P 16A + RCD 25A, 30mA type A for "Spare"

The price includes the costs for the preparation of the fund, transport and installation on site, compliance with the CE and DOP marking for construction products provided for by Regulation no. 305/2011 (EU) and anything else to give the finished work in a workmanlike manner.

6. INSULATION

6.1. Generality

The thermal insulation must be made in compliance with current legislation, with particular reference to law no. 10 of 09/01/1991.

6.2. Method of execution

During installation, the Contractor must always scrupulously comply with the prescriptions, standards and suggestions of the manufacturing company, in order to avoid affecting the protective quality of the insulating materials used.
In the execution, which can also take place in discontinuous and subsequent phases, if ordered by the D.L., the utmost care must be taken to avoid thermal bridges, non-insulated sections, etc.
All insulating materials must be stored until they are used in perfectly dry rooms.
The installation of all insulating materials cannot be started before the surfaces to be insulated are completely dry, clean of residues of mortar, grease or any other agent that may prevent their fixing or sticking.
The cut-to-size of the panels must be carried out with suitable tools suitable for the types of materials making up the panels.
The cutting surfaces must appear sharp, perfectly straight and orthogonal.

6.3. Reference legislation

- UNI 5958:1985 Mineral fibre products for thermal and acoustic insulation. Terms and definitions
- UNI 6547:1985 Mineral fibre panels for thermal and acoustic insulation. Determination of the degree of flexibility
- UNI 8811:1987 Mineral fibres. Resin-coated felts for thermal insulation. Acceptance criteria
- UNI 9299:1988 Mineral fibres. Semi-rigid resin-coated panels for thermal insulation. Acceptance criteria
- UNI 10522:1996 Mineral fibre products for thermal and acoustic insulation. Fibres, felts, panels and cupels. Determination of volatile content
- UNI EN 13162:2015 Thermal insulation for buildings – Mineral wool products (MW) obtained in the factory – Specification
- UNI EN 13164:2015 Thermal insulation for construction – Factory-made extruded polyester foam (XPS) products – Specification
- UNI EN 13167:2015 Thermal insulation for construction – Factory-made cellular glass (CG) products – Specification
- UNI EN 13168:2015 Thermal insulation for construction – Factory-made wood wool (WW) products - Specification
- UNI EN 13169:2015 Thermal insulation for buildings – Factory-made expanded perlite (EPB) panels - Specification

- UNI EN 13170:2015 Thermal insulation for buildings – Factory-made expanded cork (ICB) products - Specification
- UNI EN 13171:2015 Thermal insulation for construction – Factory-made wood fibre products (WF) - Specification

6.4. Acceptance Requirements

All insulating materials must arrive at the construction site accompanied by guarantee certificates attesting to the thermal characteristics and energy performance in accordance with the provisions of the law in force.
The durability and fire behavior of the materials themselves must also be certified.

6.5. Performance Specifications

Mineral wool fibres
The mineral wool fibers must have the characteristics declared by the manufacturer.

Polystyrene
Expanded polystyrene in sheets must be cellular, closed-cell and high-density.
Where prescribed, it will be of the sintered type.
The slabs must be of the type with improved resistance to the spread of flame; their thickness and density must comply with the requirements of the bill of quantities and in the project.
Key features:
Medium density = 30-50 Kg/mc (UNI EN ISO 845:2009)
Thermal conductivity (at +20°C) <= 0.032 W/m°K (UNI 7891)
Compressive strength (at 10% deformation) ≥ 2.5 Kg/cm²
Dimensional stability under load (variaz. max allowed 5%) = 1% (DIN 18164)
Reaction to fire = self-extinguishing (ASTM D 1962/68) class 1 (CSE RF 2/75/A - CSE FR 3/77: approved)
Water absorption by capillarity = none
Water vapour transmission speed (6-3 cm thick) = 10-17 gr./sqm 24 H
Water vapour resistance coefficient (thickness 6-3 cm) = 65-80 μ (DIN 52615)
Measurement of impact noise level (absorption) = 19 dB (UNI EN ISO 717-1:2021)
Operating temperature = -40°C +85°C
Thicknesses = 2-10 cm with or without 2 or 4 sides

Polystyrene
Obtained by expansion of polystyrene, it will be supplied in sheets of the thickness and dimensions required in the project with a density between 15 and 40 Kg/mc, as required by the project or by the D.L.; in case of condensation it must be protected by vapour barriers and will be used at a maximum temperature of 75/100 degrees C.

Polyurethane foam

Material with a low thermal conductivity value expressed in 0.020 W/m°K, it will be supplied in rigid or flexible products with a density between 30 and 50 Kg/mc and compressive strength between 1 and 3 Kgf/cm².

Fiberglass panels
Made up of rigid panels in high-density glass fibers and possible aluminum foil as a vapour barrier, they will have a thermal resistance of 0.59 square meters. K/W (0.69 sqm.h°C/Kcal) to 2.35 sqm. K/W (2.72 sq.m.h°C/Kcal), mechanical resistance and sound insulation.

Cork
The slabs will have a specific mass between 50/250 Kg/mc and a thermal conductivity, depending on the type, of 0.029 W/mK (0.025 Kcal/mh°C) or 0.055 W/mK (0.048 Kcal/mh°C), they will be made of stabilized, anti-parasite treated and fireproof material.

6.6. Sampling/testing methods

If laboratory tests show that the insulating material used or to be used does not meet the required or declared requirements, the Contractor must remove this material from the site at its own expense, even if it has already been installed, and replace it with another having the required characteristics.
When the work is completed, the thermal insulation must be unaltered and intact on the surface, in compactness and thickness; degradation of any importance due to infiltration or oxidation of any metal fastening elements will not be tolerated by the D.L./D.L.; moreover, dripping of mortars, adhesive mastics or equivalent products will not be tolerated.
Before starting the execution of the thermal insulation, the Contractor must submit to the approval of the D.L./D.A., the sampling of the insulating materials to be used, specifying the characteristics and the methods of installation indicated by the manufacturing company.
All insulating materials must be stored, until they are used, in perfectly dry rooms.
The joints due to the combination of the panels must be perfectly adherent, so as to contain heat loss within the prescribed limits; if necessary, these joints must be suitably sealed, if they are not shaped with a casement.

6.7. Tests and guarantees

For everything related to tests and guarantees, what has already been reported in the previous chapter is valid.

6.8. Note Q

Carcinogenic classification does not apply if it can be demonstrated that the substance in question meets one of the following conditions:

- A short-term biological persistence test by inhalation showed that fibers longer than 20µm have a weighted half-life of less than 10 days;

Or:

- A short-term biological persistence test by intratracheal instillation showed that fibers longer than 20µm have a weighted half-life of less than 40 days;

Or:

- Adequate intraperitoneal testing did not reveal excessive carcinogenicity;

Or:

- An appropriate long-term inhalation test led to the conclusion that there are no significant pathogenic effects or neoplastic changes.

The biological and intraperitoneal persistence tests required by Standard Q must be carried out according to the protocols:

- ECB/TM/17(97) rev. 2 Chronic Inhalation Toxicity of Synthetic Mineral
- Fibres in Rats: ECB/TM/18(97) rev. 1: Cancinogenicity of Synthetic Mineral Fibres after Intraperitoneal, Injection in Rats
- ECBITM 26 Rev. 7, 1998 – Shirt Term Exposure by Inhalatione ECBITM 27 Rev. 7, 1998 – Biopersistence of Fibres. Intratracheal Instillation.

6.9. Glass mineral wool panel without coating Knauf Mineral Wool 35

Insulating panel to be positioned in the cavity of the metal frame of plasterboard walls type KNAUF INSULATION MINERAL WOOL 35 (λD 0.035 W/mK), meeting the requirements of Ministerial Decree 23 June 2022 n° 256 of the Minimum Environmental Criteria (CAM), paragraph 2.5.7, included in the Official Gazette no. 183 of 6 August 2022, composed of glass mineral wool panels with Ecose® Technology.
Glass mineral wool panel without coating suitable for thermal and acoustic insulation of partition walls, counter walls and false ceilings, produced with recycled raw materials and with the use of Ecose® Technology, a revolutionary binder derived from vegetable raw materials, without the addition of formaldehyde, phenols and acrylic compounds, which guarantees the healthiness of indoor air and the lowest levels of VOC emissions.
The product must have the following specific technical-performance and application characteristics:
- panel dimensions: 600 x 1200 mm;
- thicknesses ranging from 120mm to 40mm depending on the system described in the walls chapter;
- declared thermal conductivity: λD 0.035 W/mK (UNI EN 13162 and 12667);
- reaction to fire (Euroclass): A1 (EN 13501-1);
- specific heat: 1,030 J/kgK (EN 10456);
- nominal density: 18kg/mc;
- resistance to the passage of water vapor μ: 1 (EN 12086);
- capillarity: none; Maximum operating temperature: +350°C;
- resistance to the passage of air AFr: > 5 kPa x s/m² (EN 29053).

CERTIFICATIONS: Euceb certificate to guarantee biosolubility and compliance with note "Q" as per Regulation (EC) No. 1272/2008 and subsequent updates; Eurofins "Indoor Air Comfort Gold" certificate, certifying indoor air quality and very low VOC (Volatile Organic Compounds) emissions; EPD (Environmental Product Declaration) certificate issued by an independent third party according to ISO 14025 and EN 15804.
The insulating panels will be inserted under pressure and continuously in the space between the uprights, laid with staggered joints, well placed together, taking care that they are not in any way compressed between the plasterboard sheets, but have an adequate thickness according to the air gap.

The panels must ensure the required acoustic performance.
The walls must ensure the required acoustic performance.

6.10. Glass mineral wool panel without coating Knauf Insulation Ultracoustic R

Glass mineral wool insulating panel without coating suitable for thermal and acoustic insulation of partition walls, counter walls and false ceilings, to be positioned in the cavity of the metal frame of plasterboard walls type KNAUF INSULATION ULTRACOUSTIC R (λD 0.037 W/mK), meeting the requirements of Ministerial Decree 23 June 2022 no. 256 of the Minimum Environmental Criteria (CAM), paragraph 2.5.7, inserted in the Official Gazette no. 183 of 6 August 2022. Composed of rigid glass mineral wool panels with Ecose® Technology, in thicknesses from 45 to 100mm.
Panel produced with recycled raw materials and with the use of Ecose® Technology.
The product must have the following specific technical-performance and application characteristics:
- roll size: width 600mm;
- thicknesses from 45 to 100mm depending on the system described in the walls chapter;
- declared thermal conductivity: λD 0.037 W/mK (UNI EN 13162 and 12667);
- reaction to fire (Euroclass): A1 (EN 13501-1);
- specific heat: 1,030 J/kgK (EN 10456);
- nominal density: 17kg/mc;
- resistance to the passage of water vapor μ: 1 (EN 12086);
- capillarity none;
- Maximum operating temperature +350°C
- resistance to the passage of air – Afr: > 5 kPa x s/m² (EN 29053);

CERTIFICATIONS: Euceb certificate to guarantee biosolubility and compliance with note "Q" as per Regulation (EC) No. 1272/2008 and subsequent updates; Eurofins "Indoor Air Comfort Gold" certificate, certifying indoor air quality and very low VOC (Volatile Organic Compounds) emissions; EPD (Environmental Product Declaration) certificate issued by an independent third party according to ISO 14025 and EN 15804.
The insulating panels will be inserted under pressure and continuously in the space between the uprights, laid with staggered joints, well placed together, taking care that they are not in any way compressed between the plasterboard sheets, but have an adequate thickness according to the air gap.
The panels must ensure the required acoustic performance.
The walls must ensure the required acoustic performance.

7. WATERPROOFING

7.1. Generality

The bitumen coatings that are used, (possibly alternating with bituminous felt board for the formation of waterproofing membranes in multiple layers), must comply with the UNI EN ISO 4157-1:2003 standards.
Cylinder bituminous felt board and covered bituminous felt board, consisting of a support of paper impregnated with bitumen saturation, or impregnated with bitumen saturation and covered with bituminous materials, which are part of the formation of waterproofing membranes in multiple layers alternating with bituminous coatings, must comply with the UNI 3682:2017 standards "Felt paper intended to be impregnated with bituminous products".
The support for prefabricated polyester sheaths consisting of a 150-200-250 gr/sqm polyester non-woven fabric must be such that the characteristics allow impregnation and total adhesion to the sheath.
The synthetic sheets must meet the following requirements:

- High degree of elasticity;
- Resistance to breakage, tearing, static and dynamic punching, permanent deformation by traction or compression, abrasion;
- High elongation at break;
- Resistance to atmospheric agents, ozone, ultraviolet rays, radiation;
- Resistance to roots and microorganisms;
- High chemical inertia;
- Resistance to low and high temperatures;
- Very long gradual aging over time.

Prefabricated bituminous membranes consisting essentially of the stable combination of bitumen and mineral reinforcements or synthetic reinforcements (polypropylene, polyester, polyamide, etc.) must have the characteristics and requirements indicated in the UNI 8202:2016 standard "Construction – Waterproofing membranes – Determination of the coefficient of linear thermal expansion".

7.2. Method of execution

They must be carried out in a workmanlike manner and in accordance with the construction details of the project and the requirements of the respective execution regulations, after cleaning, regularization and preparation (to be included in the prices) of the surfaces to be waterproofed.
The use of special paints, solvents, etc. is therefore envisaged to ensure the perfect adhesion of the finished works to the underlying structures, to the walls of the area, etc.
At the time of carrying out the work, the laying surface must in any case be well stretched, clean and dry.
In carrying out the works, the Contractor must take special measures to ensure an effective seal of the waterproofing in correspondence with holes, passages, protruding bodies, pipes, etc.
In waterproofing carried out with sheaths, these must be laid in full compliance with the conditions established by the supplier company, with overlapping of the sheets of at least 15 cm, welds carried

out with procedures compatible with the support, flaps on the emerging septa in terms of waterproofing, for at least 30 cm on the roofs.
If expansion joints are provided in the structure to be waterproofed, the Contractor must take particular care in their execution, in accordance with the provisions of the project or prescribed by the Works Management.
When the work is completed, the waterproofing must present and maintain a perfect integrity of the mantle over time; they must also appear free from cracks, bags, moisture infiltration, tampering and other defects, even if they are caused by failure of the structures.

MULTI-LAYER BITUMEN WATERPROOFING
The waterproofing in multiple layers of bitumen, on the laying surface already prepared and adequately prepared, must be carried out by alternating the hot bitumen coatings with sheets of felt board.
The rolls of felt cardboard must be laid out beforehand on the laying surface, in order to avoid incorrect positioning that could cause imperfections in the mantle.
Each layer must be applied taking good care to seal the overlaps, to be passed over with a brush if necessary.
These overlaps must be staggered from each other and the overlap of the flaps cannot be less than 15cm.
The quantity of bitumen hot-spread on the underlying felt board cannot be less than 1.2kg/sqm.

WATERPROOFING WITH BITUMINOUS MEMBRANES
Waterproofing with prefabricated bituminous membranes with one or more layers must be carried out on the laying surface already prepared and prepared with bituminous primer.
The installation of the sheaths must take place by unwinding the rolls on the support surface beforehand, aligning and overlapping the edges of about 15cm and then rewinding them, taking care that they do not move.
The sheets must then be unrolled and heated in the lower part with a liquid gas flame, in order to determine the fusion of a thin surface layer.
They will finally be made to adhere to the support and overlaps with light pressure. Where indicated in the project and/or in the description of the price, the flame application of the first sheath can only take place on the perimeter edges and overlaps, while the second sheath will be applied by flame in total adherence to the first.
In the case of waterproofing of roofs used as gardens, flowerbeds, retaining walls, etc., the second sheath will be added in the mixture with products that make the material resistant to the action of plant roots.
The overlaps must be finished with a flame following the edges with the help of a special heated tool, taking care not to damage the underlying mantle.

WATERPROOFING WITH SYNTHETIC SHEETS
Waterproofing with prefabricated synthetic sheets must be carried out on the laying surface already prepared.
The sheets must be laid out in advance on the laying surface, in order to avoid incorrect positioning that could cause imperfections to the surface.

The edges of the sheets must overlap by at least 4cm and be welded using a hot air torch, heating the two flaps and at the same time exerting pressure on the sheets with a special roller.
Welding can also be carried out with suitable solubilizers, inserting a panel connected to a solubilizer dispenser between the edges to be welded and immediately exerting pressure on the flaps with a special roller.
Before starting welding, the surfaces to be welded must be clean and dry.
Both hot air and solubilizer welds must be checked by sliding a metal tip along them and then pass again with the hot air torch, if any leaks are found.
Sheets laid on horizontal planes must be turned upwards against vertical walls, chimneys, aerators, etc., for at least 30 cm.
In particular, it is necessary to provide for the laying of impermeable sheaths on the brick walls, or in blocks of lightened cement conglomerate, of the floors at lower levels, in order to create a barrier against the rise of moisture from the ground.

7.3. Reference standards for materials and test methods

- UNI EN 495-5:2013 Flexible membranes for waterproofing - Determination of bendability at low temperatures – Part 5: Rubber and plastic membranes for waterproofing roofs
- UNI EN 1107-1:2002 Flexible membranes for waterproofing - Bituminous membranes for waterproofing roofs - Determination of dimensional stability
- UNI EN 1107-2:2002 Flexible membranes for waterproofing - Determination of dimensional stability - Plastic and rubber membranes for waterproofing roofs
- UNI EN 1109:2013 Flexible membranes for waterproofing - Bituminous membranes for waterproofing roofs - Determination of cold flexibility
- UNI EN 1110:2011 Flexible membranes for waterproofing – Bituminous membranes for waterproofing roofs – Determination of hot flow
- UNI EN 1296:2002 Flexible membranes for waterproofing - Bituminous, plastic and rubber membranes for waterproofing roofs - Method of artificial aging by long-term exposure to high temperatures
- UNI EN 1844:2013 Flexible membranes for waterproofing – Determination of ozone resistance – Plastic and rubber membranes for waterproofing roofs
- UNI EN 1847:2010 Flexible membranes for waterproofing – Plastic and rubber membranes for waterproofing roofs – Methods for exposure to liquid chemical agents, including water
- UNI EN 1848-1:2002 Flexible membranes for waterproofing - Determination of length, width and straightness - Bituminous membranes for waterproofing roofs
- UNI EN 1848-2:2002 Flexible membranes for waterproofing - Determination of length, width, straightness and flatness - Plastic and rubber membranes for waterproofing roofs
- UNI EN 1849-1:2002 Flexible membranes for waterproofing - Determination of thickness and air mass - Bituminous membranes for waterproofing roofs

- UNI EN 1849-2:2019 Flexible membranes for waterproofing - Determination of thickness and air mass – Part 2: membranes for waterproofing plastic and rubber roofs
- UNI EN 1850-1:2001 Flexible membranes for waterproofing - Determination of visible defects - Bituminous membranes for waterproofing roofs
- UNI EN 1850-2:2001 Flexible membranes for waterproofing - Determination of visible defects - Plastic and rubber membranes for waterproofing roofs
- UNI EN 1928:2002 Flexible membranes for waterproofing - Bituminous, plastic and rubber membranes for waterproofing roofs - Determination of water tightness
- UNI 8202:2016 Construction – Waterproofing membranes – Determination of the coefficient of linear thermal expansion
- UNI EN 12310-2:2019 Flexible membranes for waterproofing - Determination of tear resistance – Part 2: Plastic and rubber membranes for waterproofing roofs
- UNI EN 12311-1:2002 Flexible membranes for waterproofing - Bituminous membranes for waterproofing roofs - Determination of tensile properties
- UNI EN 12311-2:2013 Flexible membranes for waterproofing - Determination of tensile properties - Part 2: Rubber and plastic membranes for waterproofing roofs
- UNI EN 12316-2:2013 Flexible membranes for waterproofing - Determination of the resistance to detachment of joints – Part 2: Plastic and rubber membranes for waterproofing roofs
- UNI EN 12691:2018 Flexible membranes for waterproofing - Bituminous, plastic and rubber membranes for waterproofing roofs - Determination of impact resistance
- UNI EN 12730:2015 Flexible membranes for waterproofing - Bituminous, plastic and rubber membranes for waterproofing roofs - Determination of resistance to static load
- UNI EN 13416:2003 Flexible membranes for waterproofing - Bituminous, plastic and rubber membranes for waterproofing roofs – Rules for sampling
- UNI EN 13583:2012 Flexible membranes for waterproofing - Bituminous membranes, plastic and rubber membranes for waterproofing roofs - Determination of hail resistance.

7.4. Acceptance Requirements

Contractor's charges and obligations included in the on-site supply
All the services listed in the contractual documents to give the completed works as specified in this specification, in particular the following.
The control of planimetric and altimetric heights and the good execution of the laying plan.
The issue of a declaration of acceptance of the laying plan.
Materials, equipment, specialized and ordinary labor for the execution of the works.
Before the start of the installation of the materials, it will be the responsibility of the Contractor to verify that the environmental conditions of the construction site, with regard to internal humidity, the presence of water or dust, do not represent a risk of degradation of the material and finishes.

This inspection must be carried out promptly so that any necessary restoration work can be carried out in time to comply with the work schedule.
Supply of materials, unless otherwise decided at the time of ordering.
Transport, unloading, storage, protection and custody of materials in environments prepared by the Contractor.
Various transport equipment from the warehouse to the place of use.
Equipment, specialized and ordinary labor for the installation of materials.
Rooms suitable for: shelter, changing room, refectory, etc. for the Contractor's staff, as required by current health and safety regulations in the workplace.
Power and water lines from existing on-site gripping points to user tools.
The tracing operations starting from the cornerstones that will be indicated by the Works Management.
Cleaning and all the necessary protections to avoid any and all damage to the finished works.
The restoration of any works damaged during the laying of materials for entire fields.
The transport from the places of installation and the stacking within the construction site, in a fenced area, previously indicated by the Works Management, of the waste and waste materials. The transport of the same to the disposal sites, including all related charges and practices.
The cleaning of the areas used for the stacking of materials and waste.

For waterproofing works, in addition to the project documents, all the executive choices must be agreed with the Works Management with reference to the following, in order to identify the best technical solution in the light of the cases that may actually arise during the execution of the works.
When the terraces, balconies or roofs have particular and irregular shapes, it will be necessary to provide, in addition to the structural joints, joints that also and only affect the waterproof mantle.
The methods of construction may be different, also depending on the needs of use or architecture; in general, however, the joints can be flat or raised with bellows metal plates (copper or other) and sealants the former, and with metal covers the latter; this, of course, without any prejudice to any other technical solution of proven validity.
The laying surfaces of the thresholds of doors and balconies or window sills must be arranged uphill inwards.
If the foot of the waterproofed walls is made of plinths of marble, stoneware or other material, the visible faces of the cladding elements must be on the same level as the upper finished wall, as no overhangs of any kind are allowed.
Where it is not possible to proceed with an effective installation of the vertical joints of the waterproofing membrane, suitable metal flashings must be positioned for protection.

7.5. Performance Specifications

The Contractor, for each batch of materials that he will use in the preparation of the products, must provide the Works Management with the relative certificate of origin with the results of the tests to which they have been subjected in the factory or at Official Laboratories.
The Works Supervision and the Inspector reserve the right to have samples taken of materials to be tested according to the regulations. The related costs will be borne by the Contractor.

7.6. Sampling/testing methods

Relating to individual components
The Contractor must submit for approval a double series of samples of the materials used and the most significant nodes of the products.
These samples must be approved by the Works Management: one series will be kept by the Contractor and one series by the Client.
Without written approval from the Works Management, the works both in the workshop and on the construction site cannot begin.
Relating to components and system in place
Where required by the project or by the Works Management, the approval of the samples is in any case subject to the simultaneous approval of the components and systems made on site in order to assess the suitability and relationship between them.

7.7. Tests

During the course of the works, at the request of the Works Management, samples of the various materials will be taken to ascertain their compliance with this specification, according to the procedures established by the Tester, after consulting the Designer and the Works Management.
Testing of such samples will be performed as stipulated in the Agreement.

7.8. Guarantees

Both the waterproof membranes, and the complementary waterproofing works in general, must be guaranteed by the Contractor for no less than 10 years, starting from the date of testing and final acceptance of the work.
If, within the longer term, there are complaints of waterproofing defects in the works carried out or degradation and defects of any kind (swelling, cracks, cracks, detachments) the causes of which are attributable to the Contractor as they are not the result of:

- Damage attributable to the Client or third parties;
- Lack of normal cleaning and maintenance;
- Tampering with or alterations to the operating conditions envisaged;
- Collapse or damage to the load-bearing structure or the laying surface of a width greater than what is naturally admissible or acceptable (for pre-existing structures or structures built by another company).

The Client shall notify the Contractor in writing so that, within a maximum period of 7 days, the inconveniences complained of and any damage resulting may be eliminated.
In default, the Client, even in derogation of art. 1218 of the Civil Code, will have the right to proceed with the elimination of the damage that has occurred, charging the Contractor with the related costs.

7.9. Waterproof membranes

The limit values of the most significant characteristics for BPP, BPE and PVC membranes must be identified within the three classes reported by the Iglae code of practice (Institute for the guarantee of works related to construction) and subsequent regulatory updates:

- Class A: higher level;
- Class B: excellent level;

- Class C: good level.

7.9.1. BPP modified bitumen membranes

The main performance characteristics of a plastomer-polymer bitumen membrane to be used as a sealing element, whether alone or in combination with other membranes, must be:
Thickness: The thickness in a BPP membrane, measured in accordance with the UNI EN 1849-1 standard, must be equal to the nominal value ± 10%. (Membranes with superior characteristics, class A, will have a narrower range of variability, equal to ±5%).
Areic mass: The areic mass of a BPP membrane, measured in accordance with the UNI EN -1849-1 standard, must be equal to the nominal value ±7%.
Water impermeability: The water impermeability of a BPP membrane, measured in accordance with the UNI EN 1928:2002 standard, must be greater than 60 kPa, i.e. it must pass the test with method A of the aforementioned standard.
Tensile strength: The minimum longitudinal and transverse tensile strength for a BPP membrane (which varies according to the type of reinforcement that characterizes it) must fall within the values reported in the following tables in accordance with the UNI EN 12311-1 standard (the value reported is expressed in daN necessary to break a 50mm diaphragm strip).

Table 2 - Minimum longitudinal tensile strength for BPP membranes

Membrane quality Armor Type	Class A	Class B	Class C
Non-woven polyester	55	55	50
Non-woven polyester and glass veil	50	50	40
Glass Veil	Not usable	30	30

Table 3 - Minimum Transverse Tensile Strength for BPP Membranes

Membrane quality Armor Type	Class A	Class B	Class C
Non-woven polyester.	55	55	45
Non-woven polyester and glass veil	35	35	30
Glass Veil	Not usable	18	18

Elongation at maximum load: The elongation at maximum longitudinal and minimum transverse load for a BPP membrane (which varies according to the type of reinforcement that characterizes it) must fall within the values shown in the following table in accordance with the UNI EN 12311-1 standard (the value reported is expressed in % measured on a rectangular membrane strip 200mm long and 50mm wide).

Table 4 - Elongation at Maximum Longitudinal Load for BPP Membranes

Membrane quality Armor Type	Class A	Class B	Class C
Non-woven polyester.	35%	35%	35%
Non-woven polyester and glass veil	30%	30%	25%
Glass Veil	Not usable	2%	2%

Cold flexibility: The cold flexibility temperature measured on new membranes, in accordance with the UNI EN 1109 standard, must not exceed the values shown in the following table.

Table 5 _ Cold flexibility temperature for new BPP membranes

Membrane quality	Class A	Class B	Class C
Temperature in °C	- 15	- 10	- 5

It will also be possible to use the measurement of the cold flexibility temperature measured on membrane specimens aged in the furnace for certain periods of time and at certain temperatures in accordance with the UNI EN 1296 standard. For Class A membranes, the cold flexibility temperature after aging in an oven at 70°C for 180°C must not exceed -5°C. For Class B membranes, the cold flexibility temperature after aging in an oven at 80°C for 28 must not exceed +5°C. Under the same conditions, Class C membranes must have a cold flexibility temperature not exceeding +15°C.
Hot dimensional stability: The hot dimensional stability for a BPP membrane (which varies according to the type of reinforcement that characterizes it) must fall within the values shown in the following tables in accordance with the UNI EN 1107-1 standard. The following tables show the maximum allowable dimensional variations along the longitudinal and transverse axis depending on the different type of reinforcement.

Table 6 - Hot dimensional stability in longitudinal direction for BPP membranes

Membrane quality Armor Type	Class A	Class B	Class C
Non-woven polyester.	±0.5%	±0.6%	±0.7%
Non-woven polyester and glass veil	±0.2%	±0.2%	±0.2%
Glass Veil	Undetectable	Undetectable	Undetectable

Table 7 - Hot dimensional stability in transverse direction for BPP membranes

Membrane quality Armor Type	Class A	Class B	Class C
Non-woven polyester.	±0.5%	±0.5%	±0.5%

Non-woven polyester and glass veil	±0.2%	±0.2%	±0.2%
Glass Veil	Not usable	Undetectable	Undetectable

Resistance to static punching: The resistance to static punching of a BPP membrane (which varies according to the type of reinforcement that characterizes it) must fall within the values shown in the following table in accordance with the UNI EN 12730 standard.
The following table illustrates the minimum puncture resistance for different types of reinforcement in both types of tests compliant with the aforementioned UNI standard, the first number shows the minimum test load, measured in kg, which must not cause losses, the second the minimum test load, measured in kg, which can cause losses. (E.g.: a BPP membrane reinforced with non-woven polyester and of superior quality will have a puncture resistance, measured according to UNI EN 12730 both on a rigid and flexible support, equal to 25-35. This means that with a load of 25 kg there is no loss of waterproofing, while with a load of 35 there are losses of waterproofing).

Table 8 - Static puncture resistance for BPP membranes

Membrane quality Armor Type	Class A	Class B	Class C
Non-woven polyester.	25-35	15-25	15-25
Non-woven polyester and glass veil	25-35	15-25	15-25
Glass Veil	Not usable	0-7	0-7

7.9.2. BPE modified bitumen membranes

The main performance characteristics of a bitumen polymer elastomer membrane to be used as a sealing element, whether alone or in combination with other membranes, must be:
Thickness: The thickness in a BPE membrane, measured in accordance with the UNI EN 1849-1 standard, must be equal to the nominal value ± 10%. (Membranes with superior characteristics, Class A, will have a narrower range of variability, equal to ±5%.
Areic mass: The areic mass of a BPE membrane, measured in accordance with the UNI EN 1849-1 standard, must be equal to the nominal value ±7%.
Water impermeability: The water impermeability of a BPE membrane, measured in accordance with the UNI EN 1928 standard, must be greater than 60 kPa, i.e. it must pass the test with method A of the aforementioned UNI standard.
Tensile strength: The minimum longitudinal and transverse tensile strength for a BPE membrane (which varies according to the type of reinforcement that characterizes it) must fall within the values reported in the following tables in accordance with the UNI EN 12311-1 standard (the value reported is expressed in daN necessary to break a 50mm diaphragm strip).

Table 9 - Minimum longitudinal tensile strength for BPE membranes

Membrane quality Armor Type	Class A	Class B	Class C
Non-woven polyester.	55	55	50
Non-woven polyester and glass veil	50	50	40
Glass Veil	Not usable	30	30

Table 10 - Minimum Transverse Tensile Strength for BPE Membranes

Membrane quality Armor Type	Class A	Class B	Class C
Non-woven polyester.	55	55	40
Non-woven polyester and glass veil	35	35	30
Glass Veil	Not usable	18	18

Elongation at maximum load: The elongation at maximum longitudinal and minimum transverse load for a BPE membrane (which varies according to the type of reinforcement that characterizes it) must fall within the values shown in the following table in accordance with the UNI EN 12311-1 standard (the value reported is expressed in % measured on a rectangular membrane strip 200mm long and 50mm wide).

Table 11 - Elongation at Maximum Longitudinal Load for BPE Membranes

Membrane quality Armor Type	*Class A*	*Class B*	*Class C*
Non-woven polyester.	45±15%	35%	35%
Non-woven polyester and glass veil	45±15%	30%	25%
Glass Veil	Not usable	2%	2%

Cold flexibility: The cold flexibility temperature measured on new membranes, in accordance with the UNI EN 1109 standard, must not exceed the values shown in the following table.

Table 12 - Cold Flex Temperature for New BPE Membranes

Membrane quality	Class A	Class B	Class C
Temperature in °C	-25	-20	-15

It will also be possible to use the measurement of the cold flexibility temperature measured on membrane specimens aged in the oven, for certain periods of time and at certain temperatures in accordance with the UNI EN 1296 standard. For Class A membranes, the cold flexibility temperature after aging in an oven at 70°C for 180°C must not exceed -5°C. For Class B membranes, the cold flexibility temperature after aging in an oven at 80°C for 28°C must not exceed -5°C. Under the same conditions, Class C membranes must have a cold flexibility temperature not exceeding +5°C.
Hot dimensional stability: The hot dimensional stability for a BPE membrane (which varies according to the type of reinforcement that characterizes it) must fall within the values shown in the following tables in accordance with the UNI EN 1107-1 standard. The following tables show the maximum allowable dimensional variations along the longitudinal and transverse axis depending on the different type of reinforcement.

Table 13 - Hot dimensional stability in longitudinal direction for BPE membranes

Membrane quality Armor Type '	*Class A*	*Class B*	*Class C*
Non-woven polyester.	±0.5%	±0.7%	±1.0%
Non-woven polyester and glass veil	±0.2%	±0.2%	±0.2%
Glass Veil	Not usable	Undetectable	Undetectable

Table 14 - Hot dimensional stability in transverse direction for BPE membranes

Membrane quality Armor Type	Class A	Class B	Class C
Non-woven polyester.	±0.5%	±0.7%	± 1.0%
Non-woven polyester and glass veil	±0.2%	±0.2%	±0.2%
Glass Veil	Not usable	Undetectable	Undetectable

Resistance to static punching: The resistance to static punching of a BPE membrane (which varies according to the type of reinforcement that characterizes it) must fall within the values shown in the following table in accordance with the UNI EN 12730 standard.
The following table illustrates the minimum puncture resistance for different types of reinforcement in both types of tests compliant with the aforementioned UNI standard, the first number shows the minimum test load, measured in kg, which must not cause losses, the second the minimum test load, measured in kg, which can cause losses. (E.g.: a BPE membrane reinforced with non-woven polyester and of superior quality will have a puncture resistance, measured according to UNI EN 12730 both on a rigid and flexible support, equal to 25-35. This means that with a load of 25 kg there is no loss of waterproofing while with a load of 35 there are losses of waterproofing).

Table 15 - Static Puncture Resistance for BPE Membranes

Membrane quality **Armor Type**	*Class A*	*Class B*	*Class C*
Non-woven polyester.	25-35	25-35	15-25
Non-woven polyester and glass veil	25-35	15-25	7-15:
Glass Veil	Not usable	-0-7	0-7

7.9.3. PVC polymer membranes

The main performance characteristics of a PVC polymer membrane to be used as a sealing element, whether alone or in combination with other membranes, must be:
Thickness: The thickness in a PVC polymer membrane, measured in accordance with the UNI EN 1849-2 standard, must be equal to the nominal value ±5%.
Areic mass: The areic mass of a PVC polymer membrane, measured in accordance with the UNI EN 1849-2 standard, must be equal to the nominal value ±5%.
Water impermeability: The water impermeability of a PVC polymer membrane, measured in accordance with the UNI EN 1928 standard, must be greater than 50 kPa, i.e. it must pass the test with method B of the aforementioned UNI standard.
Tensile strength: The minimum longitudinal and transversal tensile strength for a PVC polymer membrane (which varies according to the type of reinforcement that characterizes it) must fall within the values shown in the following table in accordance with the UNI EN 12311-2 standard (the value reported is expressed in daN necessary to break a 50mm membrane belt).

Table 16 - Minimum longitudinal and transverse tensile strength for PVC membranes

Orientation **Armor Type**	Longitudinal	Transversal
Reinforced glass veil without non-woven polyester bottom finish	200%	200%
Reinforced glass veil with non-woven polyester bottom finish	80%	80%
Reinforced polyester fabric	12%	1,2%
Reinforced glass fabric	2%	2%
Reinforced glass veil + woven glass with non-woven polyester bottom finish.	2%	2%
Homogeneous unreinforced with or without non-woven polyester bottom finish (*)	270%	270%

(*) Test according to method B of the UNI EN 12311 part 2 standard, the values are expressed in daN/mm²

Elongation at maximum load: The elongation at maximum longitudinal and minimum transverse load for a PVC polymer membrane (which varies according to the type of reinforcement that characterizes it) must fall within the values shown in the following table in accordance with the UNI EN 12311-1 standard (the value reported is expressed in % measured on a rectangular membrane strip 200mm long and 50mm wide).

Table 17 - Elongation at maximum longitudinal and transverse load for PVC membranes

Orientation **Armor Type**	Longitudinal	Transversal
Reinforced glass veil without non-woven polyester bottom finish	200%	200%
Reinforced glass veil with non-woven polyester bottom finish	80%	80%
Reinforced polyester fabric	12%	1,2%
Reinforced glass fabric	2%	2%
Reinforced glass veil + woven glass with non-woven polyester bottom finish.	2%	2%
Homogeneous unreinforced with or without non-woven polyester bottom finish (*)	270%	270%

(*) Test according to method B of the UNI EN 12311 part 2 standard.

Cold flexibility: The cold flexibility temperature measured on PVC polymer membranes, in accordance with the UNI EN 495-5 standard, must not exceed -35°C.
Hot dimensional stability: The hot dimensional stability for a PVC polymer membrane (which varies according to the type of reinforcement that characterizes it) must fall within the values shown in the following table in accordance with the UNI EN 1107-2 standard. The following table shows the maximum allowable dimensional variations along the longitudinal and transverse axes depending on the different type of reinforcement.

Table 18 - Hot dimensional stability for PVC membranes

Armor Type	**Dimensional variation**
Reinforced glass veil with or without non-woven polyester bottom finish	0,1%
Reinforced polyester fabric	0,5%
Reinforced glass fabric	0,1%
Reinforced glass veil + woven glass with non-woven polyester bottom finish	0,1%
Homogeneous unreinforced with or without non-woven polyester bottom finish (*)	1,0%

(*) Test according to method B of the UNI EN 12311 part 2 standard.

Resistance to the action of roots: In the case of use of PVC membranes for the waterproofing of roof gardens or pots made on site on the roof of buildings, regardless of the type of reinforcement, the

PVC membranes must not have any perforation after a resistance test to the action of the roots conducted according to the indications of the UNI 8202 part 24 standard.
Reaction to fire: PVC polymeric membranes must be Class 2 or 3 in a reaction to fire test conducted according to the UNI 8202 part 25 standard.

7.9.4. Extruded high-density polyethylene (HPDE) membranes for underground/retaining structures

Protective and waterproofing system consisting of extruded high-density polyethylene (HPDE) membrane type POLYFOND KIT, with 7 mm star reliefs, with lateral mechanical sealing by overlapping the flaps.
Fixing by means of a POLYFOND KIT finishing corner profile in extruded high-density polyethylene (HPDE), 200 cm long and 7 cm high with passage holes in the upper part every 24.5 cm and polyfond kit fixing washers in a hemispherical shape, solid, complete with 25 mm galvanized steel nails, to be fixed by percussion.
Specifications:

Material	Special high-density polyethylene
Color	Black
Certified mechanical resistance	320 kN/sqm (32 t/sqm)
Roll size (m)	1.0X30 – 1.5X30, 2.0X30 – 2.5X30 – 3.0X30
Clew height (mm)	7
Number of bosses per sqm	c. 1860
Air volume between clews	5 l/sqm approx.
Dimensional tolerance	+/- 4%

7.10. Surface preparation and installation of waterproof membranes

7.10.1. General provisions

As a rule, before starting the waterproofing works, the Contractor must ascertain the perfect leveling of the laying surface, providing, if there are differences in the plan, for the regularization of the same support surfaces with appropriate cement-based mortar. When the work is carried out, the waterproofing laying surface must in any case be well stretched, clean and dry.
During the execution of the works, the Contractor must take special measures to ensure effective waterproofing of the surfaces in correspondence with holes, reed passages, hoods, etc., so as to avoid water infiltration.
The waterproofing must be turned over for a height appropriate to the works concerned and their location, as indicated in the project tables and must be extended under the entire laying surface of the thresholds of doors and vertical openings that give access to the waterproofed floor with double vertical flap.
In all cases of flap between horizontal and vertical surfaces, compensating angles made of incompressible material must be applied.
For multilayer applications, the sheets must be laid in staggered rows with the overlaps of the second layer that must fall in the center of the first.

The longitudinal overlaps must also be perpendicular to the slopes, they will be 10 cm wide and, in the case of vertical waterproofing membranes, with the sheet at a higher level surmounting the sheet at a lower level. The head overlaps must be 20 cm wide.
The waterproofing membranes cannot be carried out on rainy or humid days. All materials must be of excellent quality and the execution of the works must take place according to the best technique with the use of the most suitable equipment and specialized and expert labor.
When the work is completed, the waterproofing must present and maintain a perfect integrity of the mantle over time; they must also appear free from cracks, bags, moisture infiltration, tampering and other defects, even if they are caused by settling of the structures.
The Contractor will guarantee the proper conservation of the mantles, possibly providing, at its own expense, for the construction of provisional protection works for the entire duration of the construction site. The Contractor must also dispose of rainwater from the horizontal waterproofing for the entire duration of the construction site.
Surface preparation: Before laying the membranes, any ribs, protruding iron, stagnant water, waste, etc., must be removed from the surfaces; To eliminate dust and dusty residues from processing, sawdust moistened with water must be distributed on the laying surface and then removed, while residues from previous processing (paints, glues, etc.) must be removed with a pressurized water jet.
The elimination of mosses and materials of organic origin (in roofs) must be carried out by washing with a 10% solution of sodium hypochlorite with subsequent brushing in the event of chalking.
In the case of laying membranes on metal surfaces, any traces of grease must be removed using appropriate solvents.

7.10.2. Bituminous emulsion

The product must be spread evenly with a quantity of about 0.3 kg/sqm (for one coat), obtaining a layer thickness between 1 and 3 mm. The bituminous emulsion must be distributed insisting on edges, variations in the laying surface, corners, etc., so as to always finish the connecting side, taking care not to let the coating end up on the corner between the laying surface and the connecting element, but to go up or down on the surfaces of these elements as far as possible.
For distribution on roof surfaces, the product must also be laid on any metal parts present on the laying surface, in particular on connecting metal sheets (roof-chimney), along the eaves line on the metal band or on the shaped sheet metal part of the eaves itself.
In correspondence with fittings with vertical insulating panels (closing insulation), the product must be distributed for at least 20cm, along the perimeter of the insulation, right at the fitting itself.
For distribution on glass-type armatures, the product must be spread using a roller, pressing lightly on the armature, without moving it from its seat and preventing the edges from rolling up.
The bituminous emulsion must dry for at least 24 hours, avoiding placing objects or weights on the coated parts; Any subsequent intervention (distribution of a second coat or installation of waterproofing membranes) must be carried out after the first coat of product has completely dried.
The application of the product must not be carried out with external temperatures below +5°C and above +35°C and in the event of a drop in temperature below +5°C foreseeable within 24 hours after application.

7.10.3. Installation methods

Waterproofing with prefabricated bituminous sheaths must be carried out with an installation surface already prepared and prepared with bituminous primer.
The exhaust vents, the ventilation towers and all the elements emerging from the laying surface must be well mechanically fixed.
Before carrying out the various processes at temperatures below +5°C, the product must be stored in a dry place (avoiding unrolling the membranes) at temperatures above 5°C for at least 6 hours, in any case referring to the storage instructions and conditions of use provided by the manufacturer.
The sheaths must be laid in advance by unwinding the rolls by overlapping by about 10 cm lengthwise and 15 cm on the heads and rewinding them up to half, taking care that they remain in the right position to proceed with the application (in the case of membranes with self-protection, the finish must be removed from the lower sheet at the overlap for a strip of at least 10cm in width)
The sheets must then be unrolled and heated in the lower part with a liquid gas flame, in order to determine the fusion of a thin surface layer; they will finally be made to adhere to the support and on the overlaps with light pressure.
The overlaps must be finished with a flame following the edges with the help of a special heated tool, taking care not to damage the underlying mantle.
The types of sheath, its reinforcement, the weight per square meter and the thickness, must comply with the provisions of the descriptions of the various types and with what is indicated in the executive details. The sheaths, both in the case of single-layer and double-layer membranes, must always be flame-laid with "total adhesion" technology unless otherwise specified. In the case of application on vertical surfaces or in any case of considerable inclination, in order to further ensure the adhesion of the high parts, the membranes must be mechanically fixed with flashings in pre-painted aluminum sheet and sealed with a suitable product.
In the case of dry installation of membranes with an independent system without any connection to the substrate, the waterproof layer must be completed by a heavy covering (gravel or pavement) and suitable sliding layers (polyethylene, LDPE, non-woven, etc.) must also be provided on the waterproofing itself.

7.10.4. Leak test

The impermeability of the turf and its installation in a workmanlike manner must be tested by partial flooding of the roof with a water head of not less than 100 mm on the ridges. The test can take place in batches and must last no less than 48 hours for each batch. The test will be considered positive if no infiltration has occurred during loading and the following days. No work can be carried out on the surface of each individual lot before the positive conclusion of the leak test. The tests will also have to involve downspouts.

7.11. Vapour barriers for waterproofing systems

The vapour barrier, in the case of rooms with a "high" relative humidity rate (80% at a temperature of 20°C), must consist of a bituminous membrane weighing 2 kg/sqm reinforced with a 6/100 mm thick aluminium foil laid on a vapour diffusion layer consisting of, in turn, a bituminous membrane reinforced with a glass veil and equipped with holes; (the installation of the membrane will be carried out with oxidized bitumen coated hot after treatment of the substrate with solvent-based bituminous primer).

In the case of rooms with a "medium-low" relative humidity level (50-60% at a temperature of 20°C), the vapour barrier must consist of an impermeable membrane, based on distilled bitumen or polymers, with glass veil reinforcement weighing 3 kg/sqm, laid by flame on the substrate previously treated with solvent-based bituminous primer.
Any insulating elements placed above the vapour barrier must always be (except in the inverted roof solution) totally glued.

7.12. Sliding layers for waterproofing systems

The sliding layer must be placed between the waterproofing layers and its support and must have characteristics of rot-proofing, rigidity, low friction coefficient, good mechanical resistance; it may consist of glass felt treated with thermosetting resins, cylinder bituminous felt board, polyethylene sheet, LDPE, non-woven, etc.).
The sliding layer must be laid dry as well as the first membrane above it, which must be welded only in the areas where the sheets overlap.
The sliding layer must not be laid near the contours, the technical volumes of the roof, the vents, the ventilation fireplaces, the gutters and the expansion joints, stopping at 20-30 cm from these elements.

7.13. FL02, FL06, FL07, FL10 - Waterproofing layer for floors and walls of damp rooms and waste rooms before laying stoneware cladding

Supply and installation of an underfloor waterproofing layer, carried out by applying two coats with a trowel or spray with a plastering machine, of two-component elastic cement-based mortar, selected fine-grained aggregates, synthetic fibers and special acrylic resins in water dispersion, for a final thickness of not less than 2 mm, such as Mapelastic by Mapei.
The product must meet the requirements of EN 1504-2, according to the PI, MC and IR principles for concrete protection.
Between the first and second layer, a 4.5x4 mm alkali-resistant fiberglass mesh of the Mapenet 150 type by Mapei is laid together.
The waterproofing product can be finished with a sponge trowel on a zero skim coat. and must have the following performance characteristics:

- Density of the mixture (kg/m3): 1700
- Dough duration: 1 h (at +20°C)
- Adhesion to concrete according to EN 1542: – after 28 days at +20°C and 50% R.H. (N/mm2): 1.0 Thermal compatibility to freeze-thaw cycles with de-icing salts, measured as adhesion according to EN 1542 (N/mm2): 0.8
- Adhesion to concrete according to EN 1542: after 7 days at +20°C and 50% R.H. + 21 days in water (N/mm2): 0.6
- Elasticity according to DIN 53504 mod. expressed as elongation: after 28 days at +20°C and 50% R.H. (%): 30
- Static crack-bridging at -20°C according to EN 1062-7 expressed as maximum crack width (mm): class A3 (–20°C) (< 0.5 mm)

- Water vapour permeability according to EN ISO 7783-1: equivalent water thickness SD (m): SD = 2.4 μ = 1200
- Water impermeability expressed as capillary absorption according to EN 1602-3 (kg/m2·h0.5): < 0.05
- Carbon dioxide (CO2) permeability according to EN 1062-6 SDCO2 equivalent air thickness diffusion (m): > 50
- Reaction to fire (Euroclass): C, s1-d0
- Calcium chloride strength (after 60 days) in 30% CaCl2 solution) measured by controlling the loss of compressive strength on a ready-made concrete specimen with a w/c ratio of 0.4 protected with Mapelastic: no loss of performance
- Resistance to sodium chloride (after 60 days in 10% NaCl solution) by controlling the penetration of the Cl- ion into a ready-made concrete specimen with a w/c ratio of 0.8 protected with Mapelastic (mm): < 2
- Resistance to carbonation (after 60 days in 30% CO2 solution) by determining the penetration of carbonation in a concrete specimen packed with a w/c ratio of 0.8 protected with Mapelastic (mm): < 2

Waterproofing is provided for an H of 120cm on the walls of the bathrooms, on the walls subjected to the installation of sinks, full-height coating where the installation of showers is planned.
In correspondence with the other perimeter walls, a vertical flap is provided for a 10cm H (waste room).
At the foot of all the vertical flaps, a suitable reinforcement band must be placed, placed in a bridge with respect to the line of change of direction, glued, fresh, with two-component cementitious resin and then covered with the second layer of cementitious resin, respecting the curing times indicated by the manufacturer of the waterproof system adopted.

The price includes the costs for cleaning and preparing the substrate, the care and supervision of the critical points, to be carried out strictly after regularizing and cleaning the substrate before applying the waterproofing cementitious mortar; the waterproofing of the control joints, of the connections between horizontal and vertical, the appropriate elements for sealing the drains and the plant penetrations, the charges for the formation of the slopes connected to the collection points as per the project drawing, compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in order of art.

8. RAINWATER DRAINAGE

8.1. Generality

Each new rainwater collection pit will be connected directly and individually to the crooked wells prepared in the sewer, unless otherwise provided for by the design or formal order of the Works Management, and except in cases where it is necessary to create a local white water disposal network in addition to the public sewer.
In this case, this network must be adequately sized and have a final delivery to the public sewer or to a surface water body subject to the formal consent of the water body manager and with the technical procedures required by current regulations.
The connection of the manhole to the crooked or to any white water collector will be made by means of high-density stoneware, PVC or PE pipes with a diameter normally equal to 160 mm.
The pipe will always be connected to the manhole through a siphon made of stoneware. The use of this material for the siphon allows unclogging by means of high-pressure hydrants.
If a separate rainwater network is required, the diameters must be calculated according to the number of wells connected to the pipe in question.
The connection to the public sewer will take place in correspondence with the existing crooked edges or, in the absence thereof, with crooked ones specially prepared in the upper quadrant of the pipe exclusively through the use of core drills finished with a special stoneware element suitable for receiving stoneware or PVC DN 160 pipes.
Sidewalks and parking areas on the side of the carriageway will normally have a slope to discharge towards the center of the road. This is in order to facilitate the cleaning of these parts of the road space that are the most difficult to clean by mechanical means and, at the same time, those where the need for cleaning is greatest.
Furthermore, in the event of a malfunction of the drainage, with this precaution any stagnation does not involve areas normally traveled by pedestrians
Drainage works are divided into collection systems, connections, subsidiary drainage ducts defined as follows:

- "Collection systems: works that serve to intercept rainwater that falls on the road surface and make it "fall" to the bottom of a well where soil and other solid materials in suspension are deposited which are then periodically removed in periodic maintenance operations. " Connections": connection system between the manhole and the public sewer.
- "Drainage ducts": subsidiary water collection conduit that collects water from several wells and is then connected to the public sewer. Collection systems can be divided into:
- Punctual collection systems or "drains" (grid, open mouth, mixed) that collect the water conveyed to a valley point.
- Linear collection systems or channels (with upper crowning with a grid, slot or track) that collect the water conveyed along a valley line

8.2. Point collection systems

The drains use manholes made up of special interchangeable pieces of prefabricated reinforced concrete.

In the case of grating drains, the crowning device of the sump consists of a grate coplanar with the surface to be drained through which the water on the surface falls into the sump. In this case, the manhole is normally located close to the curb on the side of the roadway. The grate can be removed to carry out periodic maintenance operations on the sump. Different locations of the grating drains are to be avoided as only this position prevents the grid, normally no wider than 50 cm, from being stressed by moving vehicles. Beyond the class of grid used, this translates into greater silence, comfort for users and a reduction in maintenance costs.
In the case of the wolf's mouth drains, the water is intercepted through a rectangular opening, with a useful height of not less than 5 cm and a useful width of not less than 40 cm, made in the granite curb and in the adjoining well located on the sidewalk.
The contiguity between the sump and the curb is a guarantee of the functionality of the open mouth. If it is not possible to achieve this contiguity, the expedient of connecting the curb with the opening of the wolf to the manhole with a circular pipe that can never guarantee a useful section equivalent to that of the mouth of the open air can be accepted.
It is therefore of fundamental importance to ensure that the wells of the wolf mouths obtained from the curbs are, as far as possible, close to the curb on the sidewalk. In the case of drains with wolf's mouths obtained from the curb, the system is completed by a removable metal manhole cover to allow maintenance of the manhole.
The openings can also be made by interrupting the curb at the manhole and using a metal crowning device that reproduces the shape of the missing curb and which includes, in addition to the manhole cover for inspections, a side slit that performs the same function as the opening.
In addition to the grid and open fire drains, there are mixed drains, equipped with both a grid and a wolf's mouth that normally crown a single well positioned astride the curb.
In other cases, depending on the model, two manholes are used side by side for this purpose, one on sidewalks and one on the street, i.e. a manhole on sidewalks associated with a channel on the road. The sizing and characteristics of the manhole covers must comply with the requirements of the UNI EN 124 standard.
The manhole cover with machicolation for the carriageway will have a net span of the various elements of 450 mm.
The "direct" connection includes: drain, prefabricated concrete manhole type Milan, mortara siphon d = 0.16 m in stoneware, pipe d = 0.16 m in stoneware, heavy series PVC or HDPE to be connected to the crooked d = 0.20 m of the nearest sewer pipe and drainage pipes.
The connection joints of the individual prefabricated elements must be perfectly sealed with cement mortar or welded/"sleeved" for the special polyethylene pieces.
The road manholes will be installed on a concrete substrate; the surface of the substrate must be perfectly horizontal and at a suitable height to ensure the exact altimetric location of the structure with respect to the road pavement.
The "indirect" connection provides, in addition to what is indicated above, the formation of a subsidiary network in stoneware, PVC, HDPE pipes or (for diameters greater than 40 cm) centrifuged reinforced concrete with prefabricated reinforced concrete inspection manholes with internal dimensions 1.00 x 1.00 with rings with GS 500-7 type concrete manhole cover in accordance with ISO 1083 standard with circular cover net manhole 600 mm, placed at an appropriate distance, whose heights, in some cases, may be conditioned by the structures of the underground structures.
Corrugated HDPE pipe for diameters up to and including 400 mm and radical compression reinforced concrete pipe for sewers for larger diameters must be adopted

For the laying of the ducts, the contractor must create a sand laying bed with a thickness equal to at least 2 times the wall height of the pipe in order to prevent the top of the rib from resting on unsuitable soil.
The filling must be with compaction for successive layers of 30 cm of sand up to at least 1 m of coverage on the upper extrados of the pipe. The hydraulic test on the tightness of the installed pipes must be carried out by closing with removable caps sections of the pipe subsequently subjected to static pressure applied with a piezometer or with a test pump at 0.50 bar or greater.

8.3. Linear pick-up systems

Linear water collection systems are based on channels rather than manholes and are distinguished, based on the crowning device adopted, into:

- Channels with grating, consisting of a reinforced concrete channel (polymeric, with glass fibre additives, etc.) or with a rectangular external section, a "U" or parabolic internal section crowned by a grating normally made of spheroidal cast iron, galvanised steel or stainless steel, available in different widths, from 100 to 400 mm and in the different A15 use classes, B125, C250,D400, E600, F900. Class D400 conduits are planned for the project.

Prefabricated channels for the collection of surface water in reinforced concrete with fiberglass and quartz sand, minimum resistance class C35/45 XF4, or equivalently reinforced, equipped with upper edges formed by a galvanized steel frame equipped with internal reinforcements and anchored in the body of the channel itself, with minimum frame thicknesses of 4 x 2 mm as per EN1433 standard, prepared for a grid fixing system with the additional possibility of stops + screws (nr.2 per meter), without obstacles under the grid that can prevent the evacuation of water into the channel, without built-in slope, with safety joints, made according to the EN 1433 standard.
The surface of the channel must be perfectly smooth to allow maximum water flow and to avoid stagnation of putrescible substances, mud and aggregates; it must also be devoid of connection points with the outside.
The conduits must bear the reference to the EN 1433 standard, the class to which they belong, the name or identification mark of the manufacturer, the place and date of production (also codified) and the marking In addition to the above-mentioned markings, the conduits must also bear the W marking relating to grade 2 of resistance to atmospheric agents and the +R marking relating to the presence of stagnant water containing anti-icing salts (ref. Section 6.3.3.3 of the Regulations).
The channels will be supplied associated with GGG-50 black ductile iron gratings in load class d A15/B125/C250/D400/E600/F900 according to EN 1433 standard, with a minimum height of 20 mm, prepared for a fixing system on the channel with quick and automatic closure and with the additional possibility of stops + screws prepared with a horizontal anti-sliding system of the grating on the channel made by means of cast iron protrusions inserted in the lower part of the grid itself.
The shape of the openings must be as per UNI EN 1433-2008 standard.
The grids must bear the reference to the EN 1433 standard, the class to which they belong, the name or identification mark of the manufacturer, the place and date of production (also codified) and the marking.
The installation of the channel must include the reinforcement and laying bed with concrete having compressive strength class according to the EN206 standard between C25/30 and C35/45 or between C30/37 XF4 and C40/50 XF4 depending on whether it is, respectively, "not exposed" to freeze-thaw

cycles or "exposed" to freeze-thaw cycles. The concrete must also have a consistency class of not less than S4 according to the EN206 standard and must be made with very fine stone aggregates (maximum diameter 8/10 mm)

8.4. Manholes in prefabricated concrete elements

The concrete manholes must comply with the corresponding types mentioned in the Price List, they must also be made in a workmanlike manner both in terms of the component materials (including reinforcing rods) and the appropriate processing.
The wells must be such that the piece constituting the open ring resting on one of the two free sides must not break under the action of a concentrated load of 200 kg applied progressively on the other free side at the point where its diagonals meet.
In addition, the contractor is responsible for any related costs and services of labor, provisional works, protection, tools, and everything necessary for the precise and correct execution of the installation works in a perfect workmanlike manner.
The work includes the execution of the concrete laying surface with a minimum thickness of 20 cm and, where necessary, cementitious sealing, smoothing, recovery, etc., to make the laid product always fully functional.
The casting of the bottom of the sump is to be excluded; instead, the ring with bottom provided for in the items in the Price List must always be used.
The Works Management may always have carried out, at the expense of the contractor, all the tests it deems appropriate and necessary to establish the degree of solidity of the pieces that are supplied as well as the on-site tests aimed at verifying the goodness of the installation of the artifacts.
For road manholes for collecting rainwater, the use of prefabricated monobloc structures is in any case to be excluded, but a siphon external to the structure itself must be used, the latter normally made of stoneware in order to provide adequate resistance during purging interventions using high-pressure water.
Rainwater collection wells must normally consist of a bottom ring and two extension rings.

8.5. Sewer pipe connections

The connections of the road manholes to the sewer pipes will normally be made with stoneware pipes.
Where this is not possible, the special piece on the road pipe, into which the connection will be inserted, must still be in DN200 stoneware.
The connections of private drains must always be made of stoneware and, with exceptions, pipes and special DN200 pieces will be used. When making the connection ducts, elbows, abrupt turns and changes in section must be avoided; if necessary, special connecting and reducing pieces must be used.
The manholes for the discharge of road water will consist of prefabricated concrete rings, with a ductile iron grating on a cast iron frame. The net span of the various elements will be 450 mm; that of the exhaust pipe of 150 mm.
The covering pieces of the manholes will consist of a frame in which the grids, for the gutters, and the covers, for the sidewalk ones, will be housed.

The grids may be prescribed with longitudinal or transverse bars. The contact surfaces between the grid and the frame must be flat, shaped so that the grid rests with perfect adherence, is perfectly flush and has no play with the frame
When the road sewer pipes are made of stoneware, the introduction must take place by means of simple joints, with the arm smaller than the necessary diameter, when, on the other hand, the road sewer pipes are made of reinforced concrete, the insertion will take place in different ways, depending on whether they are private drains or road wells.
In the first case, the introduction will take place by adopting the appropriate simple crooked or, depending on the prescriptions, quarters of pipe of the necessary diameter; in the second, the conduit will normally enter the sewer directly.
Connections to conduits made on site will always be made using the appropriate crooked, inclined or straight pipes, depending on the prescriptions. For the insertion of crooked pipes in prefabricated pipes or in ducts made on site, but in a time after the casting, a crooked stoneware must be inserted, after making a circular hole made by means of a core drilling machine and inserting the gasket and the special stoneware call piece; A suitable anchor block in concrete/fibre-reinforced mortar will be cast outside it. Similar procedure and care will be adopted for the direct entrance, in the same pipes, of the connection ducts of the road manholes.
Finally, in the connection between the ducts and the crooked ones, precautions must be taken to avoid the transmission on the latter of any stress that could cause them to break or detach.

8.6. PX08 – Linear rainwater collection channel

Supply and installation of a linear channel for rainwater collection, dimensions 15x1220mm and as per design request, consisting of a collecting tank and a spheroidal iron grid, able to guarantee the driveability of the vehicles provided, 4 fixing brackets, for better positioning and anchoring to the floor.
Refer to the drawings of the plant project.

Mechanical assistance, construction of tracks, connections, solutions aimed at proper functioning are included and compensated; compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

9. METAL GRATINGS FOR MANHOLES, CAVITIES AND THE LIKE

9.1. Generality

The gratings referred to in this paragraph may only be used on areas made physically inaccessible by motor vehicles.
In the case of roads and/or new buildings, grids are not allowed at a distance of less than 225 cm from the curb.
The grids will consist of metal rods welded onto a metal frame. Except for special cases provided for by the project, the metal to be preferred is steel.
In spaces traveled by pedestrians or cyclists, the sticks will normally be arranged in at least two directions perpendicular to each other, one of which is perpendicular to the main direction of travel.
In pavements only and in spaces with a single direction of travel, the rods can be arranged in parallel according to a single direction orthogonal to the direction of travel. If the pedestrian or cycle space.
In order to allow the easy circulation of all users, the distance between the elements such as not to allow the fall of a sphere with a diameter of 10 mm (anti-heel grid).
This prescription prevails, as it is more precautionary, than that provided for by the regulations on architectural barriers which provide for a sphere of 20 mm in diameter.
The top surface of the rods will be suitably knurled or otherwise machined in such a way as to ensure sufficient adhesion (not less than 0.40 in both the leather-dry flooring and rubber-wet flooring combinations, values to be measured according to the British Ceramic Research Association method).
The grids and their frames and laying methods must guarantee resistance, without permanent deformation, to a load consisting of 150 KN distributed over a square footprint on the 40 cm side placed at the heaviest point (corresponding to load pattern 3 d referred to in par. 5.1.3.3.3 of the Ministerial Decree of 14 January 2008).
For grids longer or wider than 150 cm, several load footprints of the same type will be considered at a distance of 120 cm from each other.
The works for the installation of metal gratings of any type include the formation of the frame seat, the clamps for housing the clamps, the installation of the frame and panels.
In addition, the Contractor is responsible for the costs of the barriers and the installation of the necessary signs prescribed by safety regulations and the New Highway Code as well as any related charges and services of labor, provisional protection works, tools, and what is necessary for the precise and correct execution of the works. The work includes, where necessary, cement sealing, smoothing, recovery, etc., to make the installed product always in perfect working order.
The operations referred to in this paragraph strictly follow the manufacturer's instructions in the installation regulations that the contractor will provide to the Works Management prior to acceptance of the material and, as far as not contained in the standard sheets, in the UNI/TR 11256 Technical Report.

9.2. Steel gratings

For the casting of the gratings, top quality cast steel must be used and having a tensile strength of not less than 50 kg per square millimeter and a breaking elongation of more than 12%. The resistance tests will be carried out in the legally recognized laboratories identified by the Works Management, on test bars coming from the castings of the supplied grids or on bars detached from already delivered grids, and in the latter case they will not have to undergo further annealing processes.

The test bars, coming from the castings and which will have been subjected to the same annealing process as the finished pieces, will have the heads shaped according to the shapes and dimensions prescribed by the aforementioned laboratories.
In carrying out these tests, the current standards established for the acceptance of ferrous materials will be observed.
All the support surfaces of the grid with the frame must be ground on the machine, so that the contact plane is perfect and no wobbling occurs. The grid must be at the same level as the frame and no lower height tolerance will be allowed; likewise the grille must not have a greater clearance in the frame than that indicated in the type.
Materials that have casting defects will certainly be rejected, even if masked with lead, putty or other; or did not have the established shapes and sizes; they did not have perfectly worked and matching support surfaces; had a weight for each piece less than 4% of the established weight. The supplier is required to replace with new material all the parts that suffer breakdowns or breakages during transport, during and after their installation, when such breakages are due to a defective structure or quality that does not correspond to these requirements.
All costs related to the delivery of the material are borne by the supplier.

10. SIGNAGE

10.1. Road signage

10.1.1. Technical standards for execution

As a rule, before starting the waterproofing works, the Contractor must ensure that the laying surface is perfectly levelled
In carrying out the works, the company must comply with the requirements set out below for the main categories of work.
Any type of horizontal marking to be made must comply with the provisions of the New Highway Code D.L. no. 285 of 30/04/1992, the Regulations for the execution and implementation of the New Highway Code D.P.R. no. 495 of 16/12/92, the D.P.R. 16 September 1996 no. 610, the UNI EN 1436 standard and subsequent amendments. and from the executive drawings of the project.
During the execution of the works, as a rule, traffic must not be suspended, and the company must provide, at its own care and expense, the appropriate signals, in order to avoid any road accident for which it will remain solely responsible for any purpose.

10.1.2. Quality and origin of materials

The materials to be used in the supplies and works included in the contract must correspond, in terms of characteristics, to the provisions of the Laws, Regulations and official specifications in force on the subject; in the absence of particular prescriptions, they must be of the best quality on the market in relation to the function for which they are intended.
The materials, before installation, must be recognized as suitable and accepted by the Works Management.
The materials will come from locations or factories that the Company deems convenient, as long as they correspond to the above requirements, and their origin and quality is certified.
When the Works Management has refused any provision as unsuitable for use, the Company must replace it with another that corresponds to the desired characteristics.
Despite the acceptance of the materials by the Works Management, the Company remains solely responsible for the good execution of the works even as far as it may depend on the materials themselves.
The materials to be used in the works must correspond to the requirements set out below.

10.1.3. General performance requirements for the main categories of work and supplies

As a general rule, in the execution of works and supplies, the Company must comply with the best rules of the art as well as the prescriptions that are given below for the main categories of works.
For all categories of works and therefore also for those for which there are no special regulations prescribed in these Specifications and the attached Price List, the Company must follow the best procedures prescribed by the techniques and regulations in force, complying with the orders that the Works Management will give to the executive deed for this purpose.
All supplies and works in general, main and ancillary planned or eventual, must be carried out in a perfect workmanlike manner, with appropriate materials and masters that correspond to the type of work that is required and their destination.

10.1.4. Preliminary investigations

On the basis of the results of the analyses and studies carried out, the Company must submit, no later than ten days from the date of receipt of the letter of entrustment, the composition of the mixture it intends to adopt, accompanying the proposed solution with the complete original documentation of the studies carried out in the laboratory, which must meet the requirements described in the following paragraphs, with the certificates of origin issued by the manufacturer of the material and the indication of the site where the mixture is used.
The materials to be used in the processing must be supplied by Producers who demonstrate the availability of an efficient system for the quality control of production, in accordance with the provisions of the Circular of the Ministry LL.PP. no. 2357 of 16.05.1996 (Official Gazette no. 125 of 30.05.1996) and subsequent amendments; in particular, manufacturers must be in possession of the company's quality system certification according to the UNI EN ISO 9001/2008 standard and submit a declaration of conformity pursuant to the UNI CEI ISO/IEC 17050/2005 standard (general criteria for the declaration of conformity issued by the supplier).
The D.L. reserves the right to approve the results produced or to have new research carried out before carrying out
the delivery of the works. However, the approval does not eliminate the responsibility of the Company for the achievement of the final requirements of the test mixture.

10.1.5. Reflective paint

The paint that will be used for the execution of the horizontal signs must be accompanied by a technical sheet issued by an authorized laboratory, in which the general and specific characteristics relating to the wet paint product, the resulting film after drying and the glass spheres must be declared.
It can be of two types:
1 – Water-based paints with post-sprayed glass microspheres:
The paint must consist of a mixture of resin and plasticizers, pigments and filler materials all contained in a water-based suspension.
2 – Cold paints with premixed and post-sprayed glass microspheres:
The paint must consist of a mixture of resins and plasticizers, pigments and fillers, glass microspheres, all dispersed in suitable thinners or solvents.

The paint supplied must meet the requirements of these Specifications and comply with the standard:
- UNI EN 1423/2004 regarding the characteristics of glass microspheres
- UNI EN 1436 as regards the performance of road markings

During the execution of the horizontal signs, the D.L. may order the collection from the tank, of the line marking machine, of samples of about 5 kg each, to be sent by and at the expense of the Contracting Authority, to the Official Laboratories for the tests to verify the correspondence of the paint to the requirements prescribed by these Specifications and to the declaration of the characteristics of the pieceworker. Samples transferred to suitable containers (it is recommended to use metal, glass or plastic containers that have an opening wide enough to allow mechanical homogenization in the laboratory) and filled to 95% of their volume, will be hermetically sealed and labeled with the following notes necessary to uniquely identify the sample:

- Product description
- Manufacturer
- Date of manufacture
- Numbers and characteristics of the match
- Mark
- Pickup location
- Pick-up date
- Signatures of the persons in charge

The sampling will be carried out according to the UNI 8359-82 standard, point 5.
The D.L., in correspondence with the dispensing equipment, may arrange for the collection, on metal sheets with dimensions of 40*20*0.05 cm, of strips of paint, to measure their average thickness, with the aim of tracing the actual yield of the painting product.
If the paint does not comply with one or more of the required characteristics, the Administration, at its sole discretion, may impose the replacement with another suitable paint without this entailing additional costs to those agreed.
The Works Management may order, before the start of the works, a test paving (100 ml) to verify the correspondence of the characteristics between the paint installed and the design paint, the all by and at the expense of the Company on areas chosen by the Contracting Authority.

10.1.6. Plastic heat sprayed

The thermoplastic material must consist of a mixture of synthetic hydrocarbon resins plasticized with mineral oil, pigments and aggregates, glass microspheres, premixed and post-sprayed, to be applied by spray and/or by hot extrusion.
The paint supplied must meet the requirements of these Specifications and comply with the standard:
- UNI EN 1423/2004 with regard to the characteristics of glass microspheres;
- UNI EN 1436 as regards the performance of road markings
The D.L. will arrange for the execution of on-site tests to verify the roughness of the product itself, daytime visibility, contrast with the pavement and night visibility.

10.1.7. Elastoplastic laminate

The laminated strip must be made of elastoplastic, self-adhesive laminates made of high quality polymers, containing microgranules of special material with high anti-slip power, of
Pigments that are stable over time and with glass or ceramic microspheres with excellent refractive characteristics and high wear resistance. They must also be waterproof, water-repellent, anti-skidding, resistant to saline solutions, temperature changes, abrasion and must not discolor in the sun.
The material supplied must meet the requirements of these Specifications and comply with the standard:
- UNI EN 1423/2004 regarding the characteristics of glass microspheres
- UNI EN 1436 as regards the performance of road markings

10.1.8. Performance standards for road markings with reflective paint

The horizontal signs will consist of longitudinal stripes, transverse stripes and other symbols and inscriptions as per art. 40 of the New Highway Code approved by Presidential Decree no. 16.12.1992, n. 495 and art. 137 to 155 of the Implementing Regulation and subsequent amendments with Presidential Decree No. 610 of 16.09.1996 and comply in terms of colours, shapes and sizes.
The photometric, colorimetric, slipperiness and durability characteristics of the materials to be used for horizontal signs must comply with the UNI EN 1436 standard.
The colours of the road markings must correspond to the following colours of the R.A.L. scale: white R.A.L. 9016, yellow R.A.L. 1007.
The minimum functional life guarantee of all road markings, pursuant to the UNI EN 1436 paragraph 3.4 standard, will be 8 (eight) months, starting from the date of issue of the Certificate of Completion of Works; during this period it will be the responsibility of the Company to maintain the performance standards of the signs as indicated in these Specifications.
The edges of the stripes, stop lines, zebra stripes, writings, etc., must be sharp and the surfaces of the parts treated with the paint must be uniformly covered in such a way as not to show, in any case and for the entire warranty period, the color of the underlying flooring, even if it is newly built, or of the pre-existing signs.
The horizontal stripes must be perfectly aligned with the axis of the road, without skidding or twisting.
The application of the paint must be preceded by a careful cleaning of the road surface area affected by longitudinal stripes, crossings, arrows, inscriptions and symbols.
In particular, the surfaces must be free from dust, greasy and greasy substances and stains of any other nature.
It is forbidden to remove traces of oil and grease by means of solvents.
The paint must be applied to a dry road surface, free of cracks or irregularities that could hinder the application of the material and in optimal environmental conditions; in particular, care should be taken not to operate in the presence of wind to avoid dispersion of product and beads on the sides of the areas to be covered with paint.
During the drafting phase, particular care must be taken in the construction of the longitudinal stripes that affect curvilinear road sections, in the intersection areas and near obstacles placed on the road platform.
In the event that the conditions suitable for application have not been met, the Company must not proceed with the execution of the work and must notify the Works Management for instructions.
The application of the paint and post-spraying in the intersection areas must be carried out with suitable equipment that allows uniformity in the laying of the beads in post-spraying with the consequent achievement of the RL retro-reflected luminance parameters over the entire treated surface.

10.1.9. Characteristics of reflective paint

Reflective paints are paints that contain glass beads capable of retroreflecting, immediately after application, the light projected by the headlights of motor vehicles.
The paint installed must comply with the following minimum coefficients of retro-reflected luminance RL for the entire warranty period.
Permanent horizontal signal WHITE color:

- Class R2, RL $\geq$ 100 mcd*lux-1*m-2 in dry conditions;

- RW1 class, RL $\geq$ 25 mcd*lux-1*m-2 in wet conditions;

- RR1 class, PA≥ 25 mcd*lux-1*m-2 in rainy conditions.

Temporary horizontal signal YELLOW color:

- Class R3, RL ≥ 150 mcd*lux-1*m-2 in dry conditions;

- RW1 class, RL ≥ 25 mcd*lux-1*m-2 in wet conditions;

- RR1 class, PA≥ 25 mcd*lux-1*m-2 in rainy conditions.

Permanent Horizontal Signal YELLOW:

- Class R3, PA≥ 80 mcd*lux-1*m-2 in dry conditions;

- RW1 class, RL ≥ 25 mcd*lux-1*m-2 in wet conditions;

- RR1 class, PA≥ 25 mcd*lux-1*m-2 in rainy conditions.

In accordance with the provisions of the UNI EN 1436 standard paragraph 4.3 table 2 – 3 - 4.
For white paint the inorganic pigment will consist of titanium dioxide with or without the addition of zinc oxide.
As regards the fillers contained in the coating product, these must, due to their quality, shape and size, contribute to improving the mechanical resistance characteristics of the coating layer.
applied paint, and in particular to make the horizontal markings less slippery, with
S1 values of Skid resistance SRT ≥ 45 (Skid Resistance Tester) according to
established by the UNI EN 1436 paragraph 4.5 table 7 standard for the entire useful life.
The paint must not contain organic dyes and must not discolor under the action of UV rays.
The solvent or solvent mixtures used must facilitate the formation of a homogeneous longitudinal strip free of defects (the paint must adhere tenaciously to the road surface), and must also evaporate quickly without attacking the underlying bituminous binder.
The paint must be homogeneous, well ground and of a smooth and uniform consistency, it must not crust or become gelatinous or thicken; it must allow mixing in the container without difficulty, using a spatula.
The paint must not absorb greases, oils and other substances such as to cause the formation of stains and its chemical composition must be such that, applied to the road pavement, even in the summer months, it does not show traces of pollution from bituminous substances, and must in any case be suitable to resist the emergence of the bituminous binder.

10.1.10. Features of the line marking equipment for road markings

The horizontal paint markings must be carried out with special spray line marking equipment with a post-spraying device for glass beads, with the use of specialized personnel.
The equipment available to the winning company must meet the following minimum requirements:
1. Line marking machine accompanied by the following certifications:
2. EC declaration of conformity to the standards of the Machinery Directive 98/37/EC;
3. EC declaration of conformity pursuant to the Pressure Equipment Directive 97/23/EC;
4. noise detection sketch with results obtained in accordance with ISO11202/97 (LpA) and ISO3744/97 (Lwa) standards;
5. Vibration detection sketch with results obtained in accordance with ISO2631/97 standard.
For the construction of longitudinal lines, the D.L. may request line marking equipment with the following technical characteristics:
1. paint tank with a minimum capacity of 150 litres;

2. hydraulic traction on both rear wheels with variable displacement ramp for constant control of speed and therefore of the quantity of product applied;
3. Electronic hatching device with at least 6 different sizes of empty and full;
4. pneumatic guns with pneumatic spraying device with telescope;
5. manual gun for writing, zebra stripes;
6. Bead spreader device with a minimum capacity of 50 litres and relative gun with adjustable valve for closing delay with respect to the paint gun.

10.1.11. Special characteristics of reflective paint

a) Drying time
In relation to macro-roughness, deformations of the longitudinal and transversal profile of the road pavement and air humidity, the paint applied to the surface at an air temperature between +10°C and + 40°C and relative humidity not exceeding 70%, must dry within 15 minutes of application. After this period of time, the paint must not dirty or discolour under the action of the rubber wheels of passing vehicles.
Water-based paints must be used with an air temperature above 10° and with a relative humidity below 80%.
b) Color of the painting
The color of the painting, understood as the chromatic sensation perceived by the standard observer, will be
determined in the laboratory through the chromatic coordinates (x, y) on a sample of signage,
in accordance with the provisions of the UNI EN 1436 standard paragraph 4.4 table 6.
The sample of signs, on which to perform colorimetric readings, will be prepared in the laboratory, or the sample of paint sprayed directly on a metal support and taken on site at the disposal of the D.L. will be used, if present.
For the purposes of classifying the visibility of the coating product, the luminance factor β will also be measured as specified in Table 5 of the above standard.
As far as dry road markings are concerned, the luminance factor class for WHITE must be equal to $\beta \geq 0.30$, for YELLOW colour it must be equal to $\beta \geq 0.20$.

10.1.12. Special characteristics of glass spheres

The microspheres must comply with the requirements of the UNI EN 1423/2004 standard
a) Refractive index
as regards the characteristics of glass microspheres, it is required to adopt microspheres with a refractive index n conforming to Class A, $n \geq 1.50$.

10.1.13. In situ tests and measurements

a) Sliding friction resistance (SRT)
The sliding friction resistance of road markings will be measured in accordance with the provisions of appendix D of the UNI EN 1436 standard.
The friction resistance of the horizontal signs must not be less than 80% of the values measured in correspondence with the neighboring pavement and in any case the SRT value detected must not be less than 45.

The checks of the abradability values must be carried out with the "Skid Tester Resistance" device, consisting of an oscillating pendulum coupled to a rubber slider at its free end.
The instrument in question detects the loss of energy of the pendulum, caused by the friction of the cursor in
rubber on a given area of the horizontal signal, with the result expressed in SRT units.
The abradability value must be given by the average of five readings taken at each individual point chosen, in the section referred to the daily reports, if the values detected do not differ by more than three units; otherwise, successive measurements must be made until five values are obtained that do not differ by more than three units.
If the D.L. deems it necessary, it may prescribe that, in areas characterized by particularly adverse climatic conditions and near road intersections, the SRT value of the signs must not be lower than the value detected on the pavement.
b) Night visibility (RL) in dry conditions
The visibility and night visibility of the road markings will be determined on site by surveying the retroreflected luminance coefficient (RL) according to appendix B of the UNI EN 1436 standard.
Retroreflection value checks should be performed:
using high-performance dynamic instrumentation provided by a laboratory indicated by the Contracting Authority, for the automatic continuous measurement of the retroreflected luminance coefficient.
The visibility values must be measured continuously with an interval of 40 cm and must be returned with their average value for homogeneous sections of 100 m.
using portable on-site instrumentation (electroreflectomentro) provided by the company carrying out the work; it will be mandatory to provide the D.L. with a certificate of calibration of the instrumentation dated the year of execution of the works in progress.
The Works Management will carry out checks to verify the value of the retroreflected luminance coefficient; these measurements will be carried out in consultation with the Contractor, in the places that the D.L. deems most appropriate. A minimum of one check must be carried out during the useful life established by these Specifications.
Once the revision work has begun, the Works Management will carry out at least 10 control measurements for each road provided for in the contract to verify the value of the coefficient; such measurements
will be carried out in consultation with the Contractor, in the places that the D.L. deems most appropriate.
Each measurement will consist of at least 4 measurements taken at a distance of about 1 meter. Among them:
the average of the surveys will be taken as the final value.
At the discretion of the Works Management, in the event of verification of the retroreflected luminance coefficient for works to remake signs for pedestrian crossings, continuous stop strips, zebra strips, the visibility values will result from the average of three surveys carried out in the section chosen for the
control.
The measurements taken must be reported on a special report indicating the details of the
contract, the date, the kilometre progression, the exact location of the surveys and the values found; the report must be signed by the Contractor and the person in charge of the Works Management.

If the values detected are lower, the Contractor will be obliged to review the signs made and another 10 measurements have been taken to verify the value of the coefficient. In the event that the values are insufficient, the Contractor will have to repeat the procedure again.
In the third cycle of measurements showing an insufficient value, the Company has the right to terminate the contract.
Before the expiry of the prescribed warranty, or in any case before the new revision, the Works Management will carry out at least 10 control measurements for each road provided for in the contract in order to verify the value of the coefficient which must result from the average of the measurements, higher than the values indicated in the Specifications; these measurements will be carried out in consultation with the Contractor, in the places that the D.L. deems most appropriate.
If the average of the values resulting from the control measurements is lower than the minimum values provided for in these Specifications, the Company will exercise the right to deduct from the contractual guarantee an amount equal to the amount paid for the works carried out on the entire section of each road concerned.
Alternatively, the Contractor may carry out the review of all non-conforming horizontal markings and carry out the related control measurements according to the methods set out above.
All costs relating to tests, site signs, personnel, instrumentation, measurements, and anything else, will be borne by the Contractor.
c) Color (luminance factor β and chromaticity)
The checks of the trichromatic coordinates will be carried out, as required by appendix C of UNI 1436, with an instrument equipped with a light source having a spectral distribution of type D65, as defined by the ISO/CIE 10526 standard. The geometric measurement configuration to be used must be 45/0, with an illumination angle of 45°±5° and an observation angle
of 0°±10°. The angles are measured relative to the normal to the surface of the signage. The minimum measured surface area must be 5 cm2. For very rough surfaces, the measuring surface must be greater than 5 cm2, e.g. 25 cm2. The value of the trichromatic coordinates must be determined, according to the type of signage and more precisely:
Longitudinal lines:
it must result from the average of three surveys carried out in the section chosen for the control (section referring to daily reports and/or service orders). A minimum of three readings of the color coordinate values must be taken in each survey.
Symbols:
For each symbol, the value of the trichromatic coordinates will be given by the average of the readings at five different points.
Letters:
for each letter the value of the trichromatic coordinates will be given by the average of the readings in three different points.
Cross lines:
for each transversal stripe, the value of the trichromatic coordinates will be given by the average of the readings at five different points.

10.2. PK02, PK03, PK04 – Painting for road markings

Creation of reflective road markings, for pedestrian paths, direction of vehicular traffic, stop strips, zebra strips, parking stalls, parking stalls reserved for the disabled, by means of continuous or

discontinuous stripes, straight or curved, directional arrows, pictograms for disabled parking, as established by the project drawings, through the use of traffic island paint based on fast-drying alkyd resins and chlororubber, covering pigments and fillers with a specific effect; of the best reflective quality obtained with premixed glass beads, (the photometric, colorimetric and durability characteristics must comply with the provisions of the Regulations for the Execution and Implementation of the Highway Code pursuant to Presidential Decree 495 of 16/12/1992. D.P.R. n° 610 of 16/09/1996 and subsequent amendments and additions), in the minimum quantity of 80/ml grams.

We distinguish the following types of parking lots:
- PK02: white parking space, size 2.5x5 meters, with numbering, use of special white reflective traffic divider paint, on asphalt and two-component epoxy paint suitable for concrete surfaces; including masonry assistance, protection of the existing floor.
- PK03: Green Vehicle reserved parking space and symbol, size 2.5x5 meters, with the use of special green reflective traffic divider paint, on asphalt and two-component epoxy paint suitable for concrete surfaces; including masonry assistance, protection of the existing floor.
- PK04: parking space with yellow finish for the disabled, size 3.2x5 meters, with numbering, with the use of special yellow reflective traffic divider paint, on asphalt and two-component epoxy paint suitable for concrete surfaces; including masonry assistance, protection of the existing floor.

Paved with a spray compressor, with a line marking machine, by means of masks for a disabled pictogram, on a road support or on a garage floor that must be clean, free of dust and detached material. The quality parameters of the horizontal signs made must meet the minimum requirements set by the UNI EN 1436/98 standard.
The preparation of supports of any kind, the removal of any traces of dirt or dust, the positioning as per the project drawing, including any other tracking charge for works on strips of width as established by the Highway Code continuous and discontinuous, the protection of the adjacent pavement not subject to the intervention are included and compensated, cleaning, separate collection of waste material, transfer of waste material to authorised landfills, landfill allowance, compliance with the CE and PDO marking for construction products provided for by Regulation no. 305/2011 (EU) and anything else to give the finished work in a workmanlike manner.

10.3. Vertical road signs

10.3.1. Technical and qualitative characteristics of vertical signs - general

All signs must be produced by manufacturers authorized by the Ministry of Public Works and strictly compliant with the types, dimensions, and measurements prescribed by the Regulations for the Execution of the Highway Code approved by Presidential Decree no. 495 of 16/12/1992 and subsequent amendments and additions.

10.3.2. Technical and construction characteristics of vertical signs

The signs will be made of 99% pure semi-raw aluminum sheet, thickness of not less than 25/10 or 30/10 mm, with perimeter reinforced by stiffening edging made in a box.
All signs must be complete with special attachments for anchoring to the supports.

Plates with a surface area of more than sqm. 0.80, the discs, the octagonal figures of 90 cm and the direction signs, must also be further reinforced by applying, on the back and for the entire width of the sign, two stiffening crossbars, also in aluminium, completely grooved and suitable for the longitudinal sliding of the counter-brackets anchoring to the supports.
If the signs consist of two or more adjacent panels, these must be perfectly placed together by means of corrosion-resistant metal corners, suitably perforated, complete with
Stainless steel connection bolts.
The aluminium sheet must be roughened by mechanical sanding, thoroughly degreased and then subjected to a phosphachromatic process or a similar procedure of equal reliability on all surfaces.
The raw material, after having undergone these preparation processes and an antioxidant treatment with the application of Wash-Primer paint, must be fire-painted with products suitable for baking which must reach a temperature of 140 ° C.
The back and box of the signs will be further finished in neutral gray color with special synthetic enamel.
To avoid drilling, all signs must be equipped with a standard attachment (suitable for tubular iron supports with a diameter of 60 - 90 mm) consisting of vernier brackets, welded to the sign by galvanized steel counter-brackets with a thickness of mm. 3 with two holes, everything must be complete with the necessary bolts, always in galvanized steel.
The single or double-sided supports to be used for direction, location or warning signs must be made of corrosion-resistant extruded aluminium (U.N.I. 3569 in the TA 16 state) with the exposed faces entirely covered with retro-reflective film.
The welds and any other means of joining between the signal and its structural elements, connections and supports must be carried out in such a way as to guarantee its integrity from corrosion, throughout the
guaranteed service life period for each type of retroreflective material.
The supports must have the following thicknesses:
- for heights up to cm. 25, not less than 25/10 mm, over the entire development of the profile;
- for heights greater than cm. 25, not less than 30/10 of a mm., over the entire development of the profile;
- for double-sided plates, the distance between the two sides must not be less than 25 mm.

Reinforcements
Each element must have special "open omega" profiles on the back, forming a continuous channel along the entire length of the signal; this in order to further stiffen the support and to allow the housing and sliding of the bolts for tightening the brackets which, therefore.
they can also be fixed, without problems of center distance, to existing supports.
For profiles of cm. 25 and cm. 30, at least 2 "open omega" profiles are strictly required.

Joints
Each profile must have, along the upper and lower edges, 2 interlocking shapes that allow the overlapping and joining of the profiles themselves; this joint, intended to offer adequate guarantees of solidity, must take place through the use of a sufficient number of stainless steel bolts to be fixed on the back of the support.

Finishes

The modular plates in corrosion-resistant aluminum alloy must allow the interchangeability of one or more damaged modules without having to replace the entire signal and allow variations to be made both in message and format, using the original support.

Finishing and composition of the front face of the sign

The front surface of the metal supports, prepared and painted, must be finished with the application, on the entire visible face, of retro-reflective films:

- normal efficiency - Class 1;
- High efficiency - Class 2;

in accordance with the requirements for each type of signal.

On the triangles and discs of the danger, prohibition and obligation signs, the retro-reflective film must constitute a seamless coating of the entire useful face of the sign, the conventional name "one-piece" meaning by this name a whole piece of film shaped according to the shape of the sign, printed by silk-screen printing method with special transparent pastes for the colored parts and opaque black for the symbols.

The printing must be carried out with the products and methods prescribed by the manufacturer of the retro-reflective films and must maintain its characteristics for a period of time equal to that guaranteed for the duration of the retro-reflective film.

The retro-reflective films must be processed and applied to the metal supports using the equipment provided for by Art. 194, paragraph 1 of Presidential Decree no. 495 of 16.12.92 and subsequent amendments and additions.

The application must in any case be carried out in a workmanlike manner according to the prescriptions of the film manufacturer.

Films

The retro-reflective films to be used must be exclusively those of the technical specification approved by the Ministry of Public Works with the decree of 23/6/1990 and have the colorimetric, photometric, technological and durability characteristics required by the aforementioned specification.

The certificates of conformity relating to the proposed retro-reflective films must contain the results of all the analyses and tests prescribed by the aforementioned Specification and, from the description of the same, it must be clearly and unequivocally clear and unequivocal that all the tests and analyses have been carried out, according to the methods indicated, on the same samples for the entire cycle and for all the colours provided for in Table 1 of the aforementioned Technical Specification.

By means of specific checks, to be expressly reported in the certificates of conformity, it must be proven that the identification mark of retro-reflective films (Class 1) is actually integrated with the internal structure of the material, which cannot be removed and is perfectly visible
even after instrumental accelerated aging test.

Back of Signals

On the back of the signs, the provisions of Art. 77, paragraph 7 of Presidential Decree 495 of 16/12/1992 and subsequent amendments.

10.3.3. Supports

Generality

The signal supports must be sized to withstand a wind speed of 50 km/h, equal to a dynamic pressure of 140 kg/sqm (Circ. 18591/1978 of the Central Technical Service of the Ministry of Public Works relating to the Ministerial Decree of 3.10.1978).

Pole supports

The supports for vertical signs (excluding portals) must have the following characteristics:
- tubular steel with a diameter varying from 60 to 90 mm, thickness mm. 3;
- hot-dip galvanized in compliance with U.N.I. 5101 and ASTIM 123 standards, after pickling the raw material, and unpainted;
- closed at the top with a plastic cap and complete with a hole at the base for fixing the anchoring rod;
- equipped with an immovable anti-rotation device of the signal with respect to the support (excluding portals);
- complete with hot-dip galvanized steel brackets and galvanized bolts for fixing the signs.

11. BITUMINOUS PAVING

11.1. Reference standard for bitumen and bituminous binders, bituminous mixtures

- UNI EN 58:2012 Bitumen and bituminous binders – Sampling bituminous binders
- UNI/TR 11361:2010 Bitumen and bituminous binders – Bitumen for road applications most commonly used in Italy
- UNI EN 12591:2009 Bitumen and bituminous binders - Specifications for bitumen for road applications
- UNI EN 12592:2015 Bitumen and bituminous binders - Determination of solubility
- UNI EN 12593:2015 Bitumen and bituminous binders - Determination of the breaking point according to the Fraass method
- UNI EN 12594:2015 Bitumen and bituminous binders - Preparation of test samples
- UNI EN 12597:2014 Bitumen and bituminous binders – Terminology
- UNI EN 12606-1:2015 Bitumen and bituminous binders – Determination of paraffin content – Part 1: Distillation method
- UNI EN 12607-1:2015 Bitumen and bituminous binders - Determination of resistance to hardening by heat and air – Part 1: RTFOT method
- UNI EN 12697-1:2020 Bituminous mixtures - Test methods - Part 1: Soluble binder content
- UNI EN 12697-2:2019 Bituminous mixtures - Test methods - Part 2: Determination of grain size
- UNI EN 12697-3:2019 Bituminous mixtures - Test methods – Part 3: Bitumen recovery: Rotary evaporator
- UNI EN 12697-4:2015 Bituminous mixtures - Test methods - Part 4: Bitumen recovery: fractionation column
- UNI EN 12697-5:2019 Bituminous mixtures – Test methods – Part 5: Determination of the maximum density mass
- UNI EN 12697-6:2020 Bituminous mixtures - Test methods - Part 6: Determination of density in a pile of bituminous specimens
- UNI EN 12697-7:2022 Bituminous mixtures - Test methods - Part 7: Determination of the apparent density mass of bitumen specimens by gamma radiation
- UNI EN 12697-8:2019 Bituminous mixtures - Test methods – Part 8: Determination of the characteristics of voids of bituminous specimens
- UNI EN 12697-10:2018 Bituminous mixtures - Test methods – Part 10: Compatibility
- UNI EN 12697-11:2020 Bituminous mixtures - Test methods - Part 11: Determination of the affinity between aggregate and bitumen

- UNI EN 12697-12:2018 Bituminous mixtures - Test methods - Part 12: Determination of the water sensitivity of bituminous specimens
- UNI EN 12697-13:2018 Bituminous mixtures - Test methods – Part 13: Temperature measurement
- UNI EN 12697-14:2020 Bituminous mixtures - Test methods – Part 14: Water content
- UNI EN 12697-15:2022 Bituminous mixtures - Test methods – Part 15: Determination of sensitivity to segregation
- UNI EN 12697-16:2016 Bituminous mixtures - Test methods – Part 16: Abrasion by studded tyres
- UNI EN 12697-17:2017 Bituminous mixtures - Test methods - Part 17: Particle loss of porous asphalt specimen
- UNI EN 12697-18:2017 Bituminous mixtures - Test methods - Part 18: Binder drainage
- UNI EN 12697-19:2020 Bituminous mixtures - Test methods - Part 19: Specimen permeability
- UNI EN 12697-20:2020 Bituminous mixtures - Test methods - Part 20: Indentation test with cubes or Marshall specimens
- UNI EN 12697-21:2021 Bituminous mixtures - Test methods - Part 21: Plate penetration test
- UNI EN 12697-22:2020 Bituminous mixtures - Test methods - Part 22: Wheel tracking method
- UNI EN 12697-23:2018 Bituminous mixtures - Test methods - Part 23: Determination of the indirect tensile strength of bituminous specimens
- UNI EN 12697-24:2018 Bituminous mixtures - Test methods - Part 24: Fatigue resistance
- UNI EN 12697-25:2016 Bituminous mixtures - Test methods - Part 25: Cyclic compression test
- UNI EN 12697-26:2018 Bituminous mixtures - Test methods - Part 26: Stiffness
- UNI EN 12697-27:2017 Bituminous mixtures - Test methods – Part 27: Sampling
- UNI EN 12697-28:2020 Bituminous mixtures - Test methods - Part 28: Preparation of samples for the determination of binder content, water content and gradation
- UNI EN 12697-29:2020 Bituminous mixtures - Test methods – Part 29: Determination of the size of bitumen specimens
- UNI EN 12697-30:2019 Bituminous mixtures - Test methods - Part 30: Specimen preparation by impact compactor
- UNI EN 12697-31:2019 Bituminous mixtures - Test methods - Part 31: Preparation of the specimen with a rotary press
- UNI EN 12697-32:2019 Bituminous mixtures - Test methods - Part 32: Specimen preparation with a vibration compactor

- UNI EN 12697-33:2019 Bituminous mixtures - Test methods - Part 33: Specimen prepared with roller compactor
- UNI EN 12697-34:2020 Bituminous mixtures - Test methods - Part 34: Marshall test
- UNI EN 12697-35:2016 Bituminous mixtures - Test methods - Part 35: Mixing in the laboratory
- UNI EN 12697-36:2022 Bituminous mixtures - Test methods for hot bituminous conglomerates - Part 36: Determination of the thickness of a bituminous pavement
- UNI EN 12697-37:2022 Bituminous mixtures - Test methods for hot bituminous conglomerates - Part 37: Hot sand test for binder adhesion on pre-coated grit for HRA
- UNI EN 12697-39:2020 Bituminous mixtures - Test methods - Part 39: Binder content by ignition
- UNI EN 12697-40:2020 Bituminous mixtures - Test methods - Part 40: On-site drainage
- UNI EN 12697-41:2023 Bituminous mixtures - Test methods - Part 41: Resistance to anti-icing fluids
- UNI EN 12697-42:2021 Bituminous mixtures - Test methods - Part 42: Quantity of foreign material in the recovered bituminous mix
- UNI EN 12697-43:2014 Bituminous mixtures - Test methods for hot bituminous conglomerates - Part 43: Fuel resistance
- UNI EN 12697-44:2019 Bituminous mixtures - Test methods - Part 44: Crack propagation by flexure test on semi-circular specimen
- UNI EN 12697-45:2020 Bituminous mixtures - Test methods - Part 45: Aging test by determining the tensile stiffness of a sample of bituminous conglomerate conditioned by saturation in water (SATS method)
- UNI EN 12697-46:2020 Bituminous mixtures - Test methods - Part 46: Low temperature cracking by uniaxial tension tests
- UNI EN 12697-47:2010 Bituminous mixtures - Test methods for hot bituminous conglomerates - Part 47: Determination of the ash content of natural asphalts
- UNI EN 12697-49:2022 Bituminous mixtures - Test methods - Part 49: Determination of the coefficient of friction after polishing
- UNI EN 13043:2004 Aggregates for bituminous mixtures and surface treatments for roads, airports and other areas subject to traffic
- UNI EN 13108-1:2016 Bituminous mixtures - Material specifications - Part 1: Hot-produced bituminous conglomerate
- UNI EN 13108-2:2016 Bituminous mixtures - Material specifications - Part 2: Very thin layer asphalt mix (BBTM)

- UNI EN 13108-3:2016 Bituminous mixtures - Material specifications - Part 3: Conglomerate with very soft bitumen
- UNI EN 13108-4:2016 Bituminous mixtures - Material specifications - Part 4: Riveted bituminous conglomerate
- UNI EN 13108-5:2016 Bituminous mixtures - Material specifications - Part 5: Closed non-slip asphalt
- UNI EN 13108-6:2016 Bituminous mixtures - Material specifications - Part 6: Cast asphalt
- UNI EN 13108-7:2016 Bituminous mixtures - Material specifications - Part 7: Bituminous conglomerate with high void content
- UNI EN 13108-8:2016 Bituminous mixtures - Material specifications - Part 8: Reclaimed bituminous conglomerate
- UNI EN 13108-9:2016 Bituminous mixtures - Material specifications - Part 9: Bituminous conglomerate for ultra-thin layers (AUTL)
- UNI EN 13108-20:2016 Bituminous mixtures - Material specifications - Part 20: Type tests
- UNI EN 13108-21:2016 Bituminous mixtures - Material specifications - Part 21: Factory production control
- UNI EN 13179-2:2002 Tests for filler aggregate used in bituminous mixtures – Bitumen number
- UNI EN 13302:2018 Bitumen and bituminous binders – Determination of the viscosity of bituminous binders through the use of the rotational viscometer
- UNI EN 13398:2018 Bitumen and bituminous binders – Determination of the springback of a modified bitumen
- UNI EN 13399:2018 Bitumen and bituminous binders – Determination of the storage stability of modified bitumen
- UNI EN 13589:2018 Bitumen and bituminous binders – Determination of the tensile characteristics of modified bitumen through the "force ductility" method
- UNI EN 13614:2021 Bitumen and bituminous binders – Determination of the adhesion of bituminous emulsions by water immersion test
- UNI EN 13808:2013 Bitumen and bituminous binders – Reference framework of specifications for bituminous cationic emulsions
- UNI EN 14023:2010 Bitumen and bituminous binders – Framework of specifications for polymer-modified bitumen
- UNI EN 1426:2015 Bitumen and bituminous binders – Determination of needle penetration
- UNI EN 1427:2015 Bitumen and bituminous binders – Determination of the softening point – Ball and ring method

- UNI EN 1428:2012 Bitumen and bituminous binders – Determination of water content in bituminous emulsions – Azeotropic distillation method
- UNI EN 1430:2009 Bitumen and bituminous binders – Determination of the polarity of the particles of bituminous emulsions
- UNI EN 1431:2018 Bitumen and bituminous binders – Determination of residual binder and distilled oil in bituminous emulsions by distillation
- UNI EN 1744-4:2022 Tests to determine the chemical properties of aggregates - Part 4: Determination of the water sensitivity of fillers for bituminous mixtures

11.2. Control services by the Works Management

The activities relating to the measurements for the design purposes of the interventions and the possible verification of the suitability of the mixtures (both for the verification of the project or the mix design, and for the verification during construction), will be included in the sums available for the works and managed by the D.L.
The traditional tests will take place with the use of the equipment of laboratories operating in ISO 9001 Quality indicated by D.L.
The companies awarded the Contract must present to the Client the laboratory tests prepared by them and at their expense, for the definition of the mixtures to be implemented, with mix design, in accordance with the Project requirements.
The D.L. is required to view the result of the tests and may carry out checks with laboratories of its trust, without relieving the Company of the responsibility for obtaining the prescribed final performance results.
The Client reserves the right to refuse the proposed studies, requesting their reconstruction; this faculty must be exercised within 15 days of the submission of the studies.
When the Client has refused any provision as unsuitable for use, the Company must replace it with another that corresponds to the desired characteristics; the refused materials must be removed immediately from the construction site by and at the expense of the Company itself.
Despite the acceptance of the materials by the Works Management, the Company remains fully responsible for the success of the works even as far as it may depend on the materials themselves.
The Company will be obliged to lend itself at all times to the tests of the materials used or to be used, subject to all the expenses for the collection, training and sending of samples to the trusted institutes and indicated by the D.L.
The samples will be taken in an adversarial manner. They may be ordered to be stored in the premises indicated by the Works Management, subject to the affixing of seals and signatures by the Works Manager and the Company and in the most suitable ways to guarantee their authenticity and conservation.

11.3. Types of materials

The materials to be used for the works referred to in the contract must correspond, in terms of characteristics, to the provisions of the official laws and regulations in force on the subject:
The essential characteristics for the purposes of CE marking are reported in Mandate M/124 "Products for road construction". and in the prescriptive requests of the articles of work when in force.

In the absence of particular prescriptions, they must be of the best quality existing on the market.
The materials and their mixtures before installation must be recognized as suitable and accepted by the Works Management for both prescriptive and performance works.
The materials must come from locations or production sites that the Company deems convenient, provided that they meet the requirements of these Specifications.
The choice of one type of material over another or between the different types of the same material will be made, in cases not unequivocally defined by the Technical Standards, on the basis of the judgment of the Works Management.
The mandatory requirements are:

- Mixture temperature at production and delivery (threshold values)
- Minimum binder content (category and actual value)
- Particle size composition (% value)
- Content of 10-rotation voids (category and real value)

11.4. Preliminary study for mixtures (mix design)

As far as bituminous mixtures are concerned, the tests to be presented will be the following and checks may be carried out on them by the D.L.
Mixtures for base layers, binder, basebinder and wear made with both bitumen as is, soft and hard

- Expanded clay wear mix
- Draining wear of all kinds
- Surface treatments
- Micro-wear mats
- Cemented mixtures in the power plant and on site
- Hot and cold on-site recycling

All mixtures to be installed must follow the same procedure.
The project studies in paper and/or computer format complete with information on the mix design and the related tests, **at the expense of the Company**, must be received by the Client at least 2 months before the start of the works.
The studies must contain:

- Mixture to be carried out complete with information and application site (road, carriageway, lane, quantity to be produced, etc.) and production plant
- Aggregates to be used: origin, grain sizes, PSV, CLA and percentages of use including the milled material to be used
- Volumetric (% voids, volume weights) and mechanical (ITS, Rit, CTI) characteristics percentage of binder (bitumen or emulsion), type, supplier, and performance data (or supplier's data sheet)
- Possible use of additives (with the project percentages indicated).

All design curves for bituminous conglomerates must be verified using the "Rotatory Press" equipment.

If it is decided by the Client to repeat certain tests, specifically for changes to bitumen considered performance or even of other types, it will require the Companies to send to the authorized laboratories (always well in advance of the start of the works), in addition to the design studies described above, also the materials for the verification of suitability, especially:

- Aggregates and milled material to be used (15-20 kg per size, filler 2-3 kg)
- Binder (4-5 kg)
- Additives (Dopes, ACF Functional Chemical Activators: 0.5-1 kg), fibers (200-300 gr), cement (5 kg).

The only sending of the materials for the suitability tests are the responsibility of the Company.

11.5. Base course in traditional asphalt with normal bitumen

Consisting of a granular mixture, mainly crushed, composed of a mixture of coarse, fine aggregate and filler (according to the definitions given in the UNI EN 13043 Standard "Aggregates for bituminous mixtures and surface treatments for roads, airports and other areas subject to traffic"), hot produced with semi-solid bitumen for road use (with the definition and requirements of the UNI EN 12591 Standard "Bitumen and bituminous binders - Specifications for bitumen for road applications) road works"), after preheating the aggregates, laid on site by means of a vibratory paver machine and compacted with rubberized, combined and vibrating metal rollers of suitable weight.
The mixture may also include aggregates deriving from the demolition of pavements at the end of their useful life, provided that they are subjected to verification in accordance with current regulations and the provisions of the UNI EN 13108-8 standard "Bituminous mixtures: Material specifications - Recovered bituminous conglomerate".
To be considered suitable and usable, the bituminous conglomerate must be equipped with CE marking.

- The mandatory requirements are:
- temperature of the mixture at production;
- minimum binder content;
- particle size composition;
- content of the voids.

The bituminous conglomerate in place must give mechanical strength to the superstructure such as to guarantee load-bearing capacity without permanent deformation and adequate flexibility in adapting to any settlement of the substrate, even in the medium to long term. The thickness of the base layer is determined in the design phase, unless otherwise indicated by the Works Management. All the studies of the mixtures concerning the works reported in the Technical Tender Standards carried out by the executing companies must be submitted to the Works Management well in advance of the start of the works and approved by the same D.L. In any case, the acknowledgment of these will not relieve the Company of its responsibility for obtaining the prescribed final performance results.

11.5.1. Binder

The total bitumen present in the mixture will be formed by that contained in the milled material and that of the filler. The filler bitumen for road use must be provided with the CE marking certifying compliance with Appendix ZA of the UNI EN 12591 standard "Bitumen and bituminous binders - Specifications for bitumen for road applications" with reference to the additional information for semi-solid bitumen 50-70 or 70-100, reported in appendix NA.

Bitume Normale			**Limiti (UNI EN 12591)**	
Parametro	Normativa	Unità di misura	Classe 50/70	Classe 70/100
Penetrazione a 25°C	UNI EN 1426	0,1 mm	50-70	70-100
Punto di rammollimento	UNI EN1427	°C	46 - 54	43-51
Punto di rottura (Fraass)	UNI EN 12593	°C	≤ - 8	≤ - 10
Viscosità dinamica a 160°C	UNI EN 13302	Pa•s	0,03-0,10	0,02-0,10
Valori dopo RTFOT	UNI EN12607-1			
Penetrazione residua	UNI EN 1426	%	50	46
Incremento del punto di Rammollimento	UNI EN1427	°C	≤ 11	≤ 11
Variazione della massa	UNI EN 12607 - 1	%	≤ 0,5	≤ 0,8

11.5.2. Aggregated

The stone aggregates used in the bituminous conglomerate must be qualified in accordance with Regulation 305/2011 on construction products and must be CE marked, complying with the provisions of appendix ZA of the UNI EN 13043 standard.
In any case, the materials must comply with the certification systems provided for by current legislation. The mixture of aggregates must consist of coarse, fine aggregates and fillers, including fillers if necessary. Recycled material from milled material may also be used.

Coarse aggregate
The coarse aggregate (fraction larger than/equal to 2 mm) may also have rounded and/or partially crushed elements and must meet the following requirements:

Aggregato Grosso			
Parametro	Normativa	Unità di misura	Limite (UNI EN 13043)
Resistenza alla frammentazione (Los Angeles)	UNI EN 1097-2	%	≤ 25 (LA_{25})
Superfici frantumate	UNI EN 13043	---	$C_{95/1}$
Resistenza al gelo/disgelo	UNI EN 1367-1	%	≤ 1 (F_1)
Affinità bitume-aggregato (Spogliamento)	UNI EN 12697-11	%	≤ 5
Coefficiente di forma	UNI EN 933-4	---	≤ 20 (SI_{20})
Coefficiente di appiattimento	UNI EN 933-3	---	≤ 15 (FI_{15})
Contenuto di fini	UNI EN 933-1	%	≤ 0,5 ($f_{0,5}$)

Aggregate up
The fine aggregate (fraction less than 2 mm in size) must consist of crushing sands and must meet the following requirements:

Aggregato Fino			
Parametro	Normativa	Unità di misura	Limite (UNI EN 13043)
Equivalente in sabbia	UNI EN 933-8	%	≥ 60 (SE_{60})
Contenuto di fini	UNI EN 933-1	%	≤ 10 (f_{10})

11.5.3. Additive fillers

In addition to that coming from the fine fractions of the aggregates, any additive filler must come from the grinding of limestone rocks or must consist of cement or hydraulic lime. However, they will have to meet the following requirements

Filler di Additivazione			
Parametro	Normativa	Unità di misura	Limite (UNI EN 13043)
Passante setaccio UNI 2 mm	UNI EN 933-10	%	100
Passante setaccio UNI 0,125 mm	UNI EN 933-10	%	85÷100
Passante setaccio UNI 0,063 mm	UNI EN 933-10	%	70÷100
Indice Plasticità	UNI CEN ISO/TS 17892-12		N.P.
Anello e biglia (Stiffening Power) Rapporto filler/bitume = 1,5	UNI EN 13179-1	$\Delta_{R\&B}$	8÷25 ($\Delta_{R\&B}$8/25)

11.5.4. Recycled Conglomerate

Recycled (milled) bituminous conglomerate derives from the demolition of pavements at the end of their useful life both by demolition and subsequent crushing, and with milling machines directly on site. The classification of the material must be carried out according to UNI EN 13108-8.
The percentage by weight of recycled material referred to the total mixture of aggregates must be a maximum of 30%.
For the base layer, milled material from base layers, binders and wear can be recycled. The percentage of milled material to be used must be declared in the preliminary study of the mixture that the Company is required to submit to the Works Management before the start of the works.

11.5.5. Additives

Added to aggregates or bitumen, additives are natural or artificial products that improve the performance of bituminous conglomerates.

11.5.6. Adhesion activators

Additives are natural or artificial products that improve the performance of asphalts.
Adhesion activators are particular additives, whose main function is to increase, or even create, the affinity between bitumen and aggregate. This action must ensure a bond that is as stable as possible under any application condition. The additives must therefore prevent the binder from being stripped of the aggregates.
The adhesion activator must be chosen according to the chemical nature of the aggregate used for the production of the bituminous mixture. Therefore, the additive may be amine-based, polyphosphorus-based or of any other nature, provided that it allows the bitumen-aggregate affinity limit above to be met for the coarse aggregate, according to the UNI EN 12697-11 standard.

The dosage of these products will generally vary from 0.30% to 0.60% of the weight of the bitumen, depending on the lithological nature of the stone aggregate and the operating conditions (temperatures, type of mixture to be produced, etc.). The addition of additives in the bituminous binder must be carried out with suitable equipment, to ensure the exact dose and perfect dispersion in the bitumen.

11.5.7. Functional chemical activators

Functional chemical activators (ACF) are used to regenerate the characteristics of the aged bitumen contained in the bituminous conglomerate to be recycled. ACF must be multifunctional liquid additives with high regenerating power, free from the presence of aromatic oils and with a low odorous impact. The regenerant must have the chemical-physical characteristics shown in the following table:

Attivanti Chimici Funzionali			
Parametro	Normativa	Unità di misura	Valore
Aspetto	---	---	Liquido
Densità apparente a 20°C	---	g/cm^3	0,91±0,02
Viscosità 25°C	EN 20028	cP	60 ± 10
Punto di infiammabilità	EN 2592	°C	≥ 150
Pour Point	EN 20065	≤	0°C

The dosage must be equal to 0.1-0.5% of the weight of the RAP and any variations in these quantities must be duly demonstrated and justified with appropriate documentation to the D.L.
The introduction of ACF into bitumen must be carried out with suitable equipment in the storage tanks or in-line during the production cycle. These dosers must guarantee the exact dosage and their perfect dispersion in the bituminous binder.

11.5.8. Mixtures

The mixture of first-use stone aggregates and milled material must have a particle size composition determined in accordance with UNI EN 13108-1 and UNI EN 12697-2 standards, using sieves belonging to basic group + 2, and must be within the limits of the spindle indicated below:

Fuso Granulometrico			Contenuto di bitume su miscela [%] (UNI EN 13108-1)
Serie setacci UNI EN	Passante minimo [%]	Passante massimo [%]	
31,5	100	100	≥3,8 ($B_{min\ 3,8}$)
20	90	100	
16	60	90	
14	55	85	
12,5	50	80	
10	45	75	
8	40	70	
6,3	34	64	
4	25	55	
2	15	40	
1	11	29	
0,5	8	20	
0,25	5	15	
0,063	3	10	

The percentage of total binder (including bitumen present in the milled material), referred to the weight of the mixture, must be within the limits indicated in the table above.
The optimal quantity of total bitumen must be determined by the Marshall method (with reference to Stability and with specimens compacted with 75 hammer strokes per side) and, at this optimal percentage, the following requirements determined by the volumetric method must be respected:

Condizioni di prova (UNI EN 12697-31/13108-20)	Unità di misura	Limiti (UNI EN 13108-1)
Angolo di rotazione	°	1,25 ± 0,02
Velocità di rotazione	Giri/min	30
Pressione verticale	kPa	600 ± 3
Diametro del provino	mm	150
Rotazioni N1	---	10
Rotazioni N2	---	100
Rotazioni N3	---	160

The optimal mixture must have the following characteristics after compaction at N3:

Risultati richiesti	Unità di misura	Limiti (UNI EN 13108-1)
Affinità bitume-aggregato – Spogliamento (UNI EN 12697-11)	%	≤ 5
Vuoti a N1 (UNI EN 12697-8)	%	≤ 14 (V_{max14})
Vuoti a N2 (UNI EN 12697-8)	%	3÷6 (V_{min3}-V_{max6})
Vuoti a N3 (UNI EN 12697-8)	%	≥ 2 (V_{min2})
Resistenza a Trazione Indiretta a 25°C (UNI EN 12697-23)	N/mm^2	0,70÷1,40
Coefficiente di Trazione Indiretta a 25 °C (UNI EN 12697-23)	N/mm^2	60 - 250
Sensibilità all'acqua a 15°C (UNI EN 12697-12)	%	≥ 90 ($ITSR_{90}$)

11.5.9. Packaging of the Mixtures

The bituminous conglomerate must be packaged using automated fixed systems, with suitable characteristics, always kept in perfect working order in all their parts.
The production of each plant must not be pushed beyond its potential to ensure perfect drying, uniform heating of the mixture and perfect screening that ensures a suitable reclassification of the individual classes of aggregates.
Continuous systems (drum-mixer type) may also be used, provided that the dosing of the components of the mixture is carried out by weight, using suitable equipment whose efficiency must be constantly monitored.
The plant must in any case guarantee uniformity of production and be able to produce mixtures that meet those indicated in the study submitted for acceptance purposes.
Each system must ensure the heating of the bitumen to the required temperature as well as the perfect dosage of all the raw materials used.
The area intended for the storage of aggregates must be arranged in advance and conveniently to eliminate the presence of clayey substances and stagnant water that may compromise the cleanliness of the aggregates. In addition, the heaps of the different classes must be clearly separated from each other and the refueling operation of the pre-dosers must be carried out with the utmost care.
The use of discontinuous plants must be preferred; in the case of virgin material, it is necessary to proceed by screening and reclassification of the aggregates and, on the other hand, if milled material is used, it is possible to proceed by direct discharge.
The mixing time must be established according to the characteristics of the plant, to such an extent as to allow a complete and uniform coating of the aggregates with the binder.
The moisture content of the aggregates at the dryer outlet should not exceed 0.25% by weight.
The temperature of the aggregates at the time of mixing must be between 140 °C and 180 °C and that of the binder between 150 °C and 170 °C, depending on the type of bitumen used.
To verify the aforementioned temperatures, the dryers, boilers and hoppers of the systems must be equipped with fixed thermometers that are fully functional and periodically calibrated.

11.5.10. Paving Surface Preparation

Before a asphalt layer is created, the paving surface must be prepared for the purpose of
Ensure adequate adhesion between overlapping layers. The preparation must be carried out by applying
Bituminous emulsions type rapid breakage and must have the characteristics shown in the following table:

Mano d'Attacco – Emulsione cationica 55%			
Indicatore di qualità	Normativa	Unità di misura	Limiti (UNI EN 13808)
Polarità	UNI EN 1430	---	Positiva (Classe 2)
Contenuto di acqua rispetto il peso	UNI EN 1428	%	45±2 (Classe 5)
Contenuto di bitume+flussante	UNI EN 1431	%	55±2 (Classe 5)
Flussante	UNI EN 1431	%	0-3 (Classe 3)
Sedimentazione a 7 g	UNI EN 12847	%	≤ 10 (Classe 3)
Indice di rottura	UNI EN 13075-1	---	70-155 (Classe 3)
Residuo bituminoso			
Penetrazione a 25 °C	UNI EN 1426	dmm	≤ 100 (Classe 3)
Punto di rammollimento	UNI EN 1427	°C	≥ 43 (Classe 6)

The dosage must be such that the residual bitumen is equal to 0.35-0.45 kg/m2.

11.5.11. Installation of mixtures

The installation of the bituminous conglomerates will be carried out by means of vibratory pavers in a perfect state of efficiency and equipped with self-leveling automatisms.
The pavers must still leave a perfectly shaped finished layer, free of grain, cracking and free from defects due to segregation of the larger lithoid elements.
During paving, the utmost care must be taken to form the longitudinal joints, preferably obtained by promptly placing a strip next to the previous one
If this is not possible, the edge of the strip already made must be sprayed with cationic bituminous emulsion to ensure the welding of the next strip.
If the edge is damaged or rounded, it must be cut vertically with suitable equipment.
The transverse joints resulting from daily interruptions must always be made after cutting and removing the zeroing end part.
The overlapping of the longitudinal joints between the various layers must be planned and implemented in such a way that they are staggered by at least 20 cm from each other and never fall in correspondence with the two bands of the lane normally affected by the wheels of heavy vehicles.
The asphalt must be transported from the production plant to the paving site by means of transport vehicles with adequate capacity, efficiency and speed. However, always equipped with a tarpaulin cover to avoid excessive surface cooling and the formation of croutons.
The temperature of the asphalt mix at the time of controlled paving immediately behind the paver must be at least 140°C at all times.
The paving of the conglomerates must be suspended when general weather conditions may jeopardize the perfect success of the work.
The compromised layers are to be immediately removed and subsequently rebuilt at the expense of the Enterprise.
Compaction of the mixes must begin as soon as they are paved by the paver and completed without interruption.
The thickening must preferably be carried out with rubber rollers.
For the base layers, rollers with vibrating and/or combined metal wheels can also be used, of suitable weight and advanced technological characteristics in order to ensure the achievement of the maximum achievable densities.
Care will also be taken that compaction is carried out with the most appropriate methodology to obtain uniform densification at every point and avoid cracks and sliding in the newly laid layer.
The surface of the layers must be free of irregularities and undulations after compaction. A 4 m long straight rod placed in any direction on the finished surface must adhere uniformly; A maximum deviation of 5 mm can be tolerated.
The bituminous mixture of the base layer will be laid after the Works Management has ascertained that the foundation complies with the requirements of height, shape, density and bearing capacity indicated in the project.
In the case of double-layer paving, a bituminous emulsion attachment coat must be interposed between the two paves for the preparation of the laying surface of the second layer.

11.5.12. Production, transport and installation with lukewarm technology

The bituminous mixture can be produced in lukewarm, both at the request of the Works Management and by choice of the manufacturing company.
Lukewarm production can be achieved with any technology or additive, but in any case the following must be adhered to:

- The minimum production temperature of the asphalt mix is 140 °C when unloading onto the truck body;
- The temperature of the asphalt at the time of paving, checked immediately behind the paver, must be at least 85°C at all times;

The performance of the warm mixture must be the same as the hot one; therefore, all the above requirements must be complied with.

11.5.13. Acceptance of Mixtures

Well in advance of the start of work and for each production site, the Company is required to submit to the Works Management the composition of the mixtures it intends to adopt. Each proposed composition must be accompanied by complete documentation of the studies carried out and the CE markings of the raw materials used.
Once the proposed mixture study has been accepted by the Works Management, the Company must strictly adhere to it.
The quality control of the bituminous conglomerate and its installation will be carried out by laboratory tests on the constituent materials, on the mixture, on the cores extracted from the pavement and with in situ tests.

12. EXTERNAL WORKS – PAVING AND ROAD PROTECTION

12.1. Generality

In the execution of the works, the Contractor must follow the best rules so that the works are perfect in every part; therefore, it must provide craftsmen suitable for the needs of the individual works and materials of the precise origin, size, shape, weight, number, species and workmanship indicated in these specifications, in the unit price list and in any further descriptions provided by the Works Management (D.L.).
The Contractor shall demolish and rebuild, at its own care and expense, those works not carried out with the necessary diligence or with materials of the prescribed quality, size and workmanship or in any case not in conformity with the project.
The Contractor, during the execution of the works, must provide for the appropriate arrangement and diversion of all ducts and pipes of any kind, as well as the electrical and telephone lines that will be located in the places affected by the works, so as not to interfere with the works to be carried out and not to cause functional prejudice to active plant networks.
The Contractor must also provide for the connections of the aforementioned services necessary for the functionality of the works. The D.L. may prescribe the temporary suspension or limitation to specific times of works that involve vibrations or cause noise disturbance.
In any case, every means or technique must be prepared that minimizes the creation, and/or prevents the propagation to environments not directly affected by the intervention, of noise, vibrations, dust and fumes.
The confinement of the works with the necessary fencing must be carried out with material suitable for carrying out these functions, also having adequate decorum, appropriate to the place where the site is located.

12.2. Reference legislation

- UNI EN 13242:2008 Aggregates for unalloyed and hydraulically bonded materials for use in civil engineering works and road construction
- UNI EN 13285:2018 Unbound mixtures – Specifications
- UNI EN 932-1:1998 Test methods for determining the general properties of aggregates – Sampling methods
- UNI EN 932-5:2012 Test methods for determining the general properties of aggregates – Part 5: Common equipment and calibration
- UNI EN 932-6:2001 Test methods for determining the general properties of aggregates – Definitions of availability and reproducibility
- UNI EN 933-1:2012 Tests to determine the geometric characteristics of aggregates – Part 1: Determination of particle size distribution – Particle size analysis by sieving
- UNI EN 933-2:2020 Tests to determine the geometric characteristics of aggregates – Part 2: Determination of particle size distribution - Control sieves, nominal dimensions of openings

- UNI EN 933-3:2012 Tests to determine the geometric characteristics of aggregates – Part 3: Determination of the shape of granules – Flattening index
- UNI EN 933-4:2008 Tests to determine the geometric characteristics of aggregates – Part 4: Determination of the shape of granules – Shape index
- UNI EN 933-6:2014 Tests to determine the geometric characteristics of aggregates – Part 6: Evaluation of surface characteristics – Flow coefficient of aggregates
- UNI EN 933-7:2000 Tests to determine the geometric characteristics of aggregates – Determination of shell content – Percentage of shells in coarse aggregates
- UNI EN 933-8:2015 Tests to determine the geometric characteristics of aggregates – Part 8: Evaluation of fines – Sand equivalent test
- UNI EN 933-9:2022 Tests to determine the geometric characteristics of aggregates – Part 9: Evaluation of fines – Methylene blue test
- UNI EN 933-10:2009 Tests to determine the geometric characteristics of aggregates – Part 10: Evaluation of fines – Grain size of fillers (air jet sieving)
- UNI EN 933-11:2009 Tests to determine the geometric characteristics of aggregates – Part 11: Classification test for the constituents of recycled coarse aggregates
- UNI EN 13055:2016 Lightweight aggregates
- UNI EN 1097-1:2011 Tests to determine the mechanical and physical properties of aggregates – Part 1: Determination of wear resistance (micro-Deval)
- UNI EN 1097-2:2020 Tests to determine the mechanical and physical properties of aggregates – Part 2: Methods for determining the resistance to fragmentation
- UNI EN 12457-2:2004 Characterization of waste - Leaching - Conformity test for leaching of granular waste and sludge - Part 2: Single-stage test, with a liquid/solid ratio of 10 l/kg, for materials with particles smaller than 4 mm in size (with or without size reduction)
- UNI EN 1367-1:2007 Tests to determine the thermal properties and degradability of aggregates – Part 1: Determination of freeze-thaw resistance
- UNI EN 1367-4:2008 Tests to determine the thermal properties and degradability of aggregates – Part 4: Determination of shrinkage by drying
- UNI EN 1367-5:2011 Tests to determine the thermal properties and degradability of aggregates - Part 5: Determination of resistance to thermal shock
- UNI EN 1367-6:2008 Tests to determine the thermal properties and degradability of aggregates - Part 6: Determination of freeze-thaw resistance in the presence of salt (NaCl)
- UNI EN 1367-7:2014 Tests to determine the thermal properties and degradability of aggregates - Part 7: Determination of freeze-thaw resistance of lightweight aggregates

- UNI EN 1744-1:2013 Tests to determine the chemical properties of aggregates – Part 1: Chemical analysis
- UNI EN 1744-4:2022 Tests to determine the chemical properties of aggregates – Part 4: Determination of the water sensitivity of fillers for bituminous mixtures
- UNI EN 1744-5:2007 Tests to determine the chemical properties of aggregates – Part 5: Determination of acid-soluble chloride salts
- UNI EN 13036-7:2004 Surface characteristics of road and airport pavements - Test methods - Part 7: Measurement of the irregularity of pavements: measurement with the ruler
- UNI EN 13179-1:2013 Tests on complementary aggregates (fillers) used in bituminous mixtures - Part 1: Ring and ball test
- UNI EN 13286-2:2010 Unbound and Hydraulic Binder-Bound Mixtures - Part 2: Test Methods for Determination of Laboratory Reference Density and Water Content - Proctor Compaction
- UNI EN 13286-47:2022 Unbound and Hydraulic Binder-Bound Mixtures - Part 47: Test Method for Determination of CBR Lift Index, Immediate Lift Index and Swelling
- UNI EN 14227-5:2013 Mixtures bound with hydraulic binders - Specifications - Part 5: Granular mixtures bound with hydraulic binders for roads
- UNI EN ISO 14688-1:2018 Geotechnical investigations and tests - Identification and classification of soils – Part 1: Identification and description
- UNI EN ISO 14688-2:2018 Geotechnical investigations and tests - Identification and classification of soils – Part 2: Principles for a classification
- CNR B.U. n.22/72 Specific gravity of a soil in situ
- CNR B.U. n.29/72 Preparation and curing of cemented mixed specimens
- CNR B.U. n.69/78 Compaction test of a land
- CNR B.U. n.97/84 Destructive tests on concrete. Indirect tensile strength test
- CNR BU n.104/84 Identification of rocks used as road aggregates
- CNR B.U. n.146/92 Determination of the deformation modulus Md and Md' by means of a double cycle load test with a circular plate
- UNI CEN ISO/TS 17892 -1:2005 Geotechnical investigations and tests – Laboratory tests on soils – Part 1: Determination of water content
- UNI CEN ISO/TS 17892 – 12:2015 Geotechnical investigations and tests – Laboratory tests on soils – Part 12: determination of Attenberg limits

12.3. CU02 – Curb between outdoor pavements thickness 200mm

Supply and installation of prefabricated concrete curb, separating external flooring, light grey or similar to be submitted to the approval of the D.L., thickness 200mm and H 300mm, laid on concrete casting, see project drawings.

Including: the excavation to make room for the curb and the concrete substrate according to the heights established by the works management; the transport of materials; the substrate for the cementitious concrete laying bed with a thickness of 18 cm and a width of 35 cm (cement 150 kg/m³ - sand 0.400 m³ - gravel 0.800 m³); the concrete flanking as above; the discharge; the stacking and guarantees against breakage; the manpower for the tongue and groove joint; the sealing of the matching surfaces by means of cement mortar laid at 600/m³ kg; the trimming of the joints; the reworking during and after installation.

12.4. CU03 – French conduit, dimensions 500x90mm

Supply and installation of a French type road gutter made with RCK 40N/mm2 vibro-compressed concrete packaged with PORTLAND type 42.5R cement, dimensions 500x90mm, with double slope towards the inside, positioned between the pavement and the curb, see project drawings.
Including excavation, concrete flanking, laying of appropriate adaptations.
Including the preparation of the laying surface, excavation, supplementary casting in reinforced concrete, including the accessories indicated in the project, any perimeter shaping, the charges for pulling up or down down, the installation, also by specialized labor, cutting, scraping, any masonry assistance, the disposal of waste materials, sealing in material of the DL's choice, final cleaning, compliance with the CE marking and the PDO Product Production Declaration and anything else necessary to give the finished work in a workmanlike manner.

13. EXTERNAL WORKS – GREEN WORKS

13.1. NIM05 - Soil Preparation for Sowing

Execution of soil preparation for sowing or transplanting, consisting of:
- removal of weeds, trees and/or shrubs present on the land affected by the intervention with surface weeding to be carried out with a brush cutter or other suitable tool to carry out the work;
- bottom tillage with mechanical digging, an operation aimed at turning the clods and the most superficial layers of the soil to a depth of about 30/40cm.

13.2. PL01 - Carpinus betulus "Fastigiata"

Supply and planting of hardwood plants with sod of the species Carpinus betulus "Fastigiata", well formed, without lesions to the trunk and earthen bread; planted, in rows or in groups, with excavation, planting, chiming, turnstile formation, supply and distribution of fertilizers or soil improvers 50 l/plant.
Post-transplant maintenance of trees for one year.
It is essential that cultural care is performed punctually, particularly watering, which must be done from April to October, unless dry periods occur during the winter. The amount of water should not be less than 100/150 liters per plant per watering. The number of waterings during this period should be no less than 10/12 interventions. Periodic cleaning of the tree guard must be ensured, and if necessary, its restoration. This includes filling the gaps caused by the final settling of the root ball, restoration, and checking of the support stakes and jute covers, fertilization, and phytosanitary treatments. A guarantee of tree rooting is provided, including the replacement of non-vegetated plants, ensuring that at the end of the maintenance period, all transplanted trees are in good vegetative condition: for trees with a circumference ranging from 20 cm to 40 cm.

They are included and compensated, the careful preparation of the soil, the transport of essences in containers, pots, clods, etc. the guarantee of rooting, the eventual elimination and removal of dead plants (including the root system), the supply of new material and new planting and everything else necessary to give the finished work to perfection.

13.3. PL05 - Multiple varieties of shrubs

Supply and planting of shrub plants in multiple varieties with root ball of the species:
Crataegus x monogina;
Ligustrum vulgare
Prunus spinosa
Frangula alnus, well-formed
Without trunk injuries and intact root ball; planted in rows or groups, with appropriate hole formation, planting, backfilling, supply and distribution of organic soil improver 30 l/m², watering with 30 l/m² of water.

They are included and compensated, the careful preparation of the soil, the transport of essences in containers, pots, clods, etc. the guarantee of rooting, the eventual elimination and removal of dead plants (including the root system), the supply of new material and new planting and everything else necessary to give the finished work to perfection.

14. EXTERNAL WORKS – ROOFING

14.1. RS01 - External stratigraphy for technical roofing Admin Block

Stratigraphy laid on a reinforced concrete slab by the structural design, total thickness about 11.50cm.
The package described below must be guaranteed for a minimum duration of 20 years.
The following stratigraphy must be certified in class B-Roof T2 and the materials that compose it must be in class B-s3, d0.
Having the following stratigraphy:

14.1.1. Bituminous primer type MOY IMPERTENE

Supply and installation of bituminous primer type MOY IMPERTENE BITUMEN PRIMER: is a ready-to-use one-component primer, based on bitumen in organic solvent used as a preparer for roofs and terraces to be coated with bituminous membranes.
Application method: it can be applied by brush, roller or long-handled brush depending on the size of the substrate to be treated.
Application instructions:
• It is always advisable to shake before proceeding with its application.
• The bituminous membrane can be applied 15 minutes after the primer has been applied.
• It should also be noted that smoking is prohibited during the application of Impertene Bitumen Primer. In addition
Avoid the accumulation of electrostatic charges, flames and sparks.
• Impertene Bitumen Primer is highly temperature sensitive. At low temperatures, the viscosity of the product increases and drying times are longer; on the contrary, high temperatures, while not significantly affecting the viscosity of the product, shorten drying times.
Temperatures between 15°C and 30°C allow optimal applications to be obtained without significant variations in solvent release times.
• Impertene Bitumen Primer can be applied directly to already rusted surfaces.
• The product contains solvents; Its application must therefore be carried out in well-ventilated rooms.

Composition: based on organic solvent bitumen.
Type of product: single-component, ready to use, the product must not be diluted.
Appearance Black liquid.
Specific gravity g/dm3 950 (±50)
Viscosity Ford 4 cup at 20°C 15 ÷ 25 sec

Including treatment of vertical flaps.
For any other specifications, refer to the manufacturer's data sheets.

The costs for cleaning and preparation of the base, cleaning for work purposes, compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner are included and compensated.

14.1.2. Waterproofing membrane type MOY PARAFLEX NT3

Supply and installation of MOY PARAFLEX NT3 type waterproofing membrane with "air and vapour control layer" function: it is an SBS polymer modified bitumen waterproofing membrane to be used as a base or air layer and vapour control layer, under waterproofing systems.
Paraflex remains flexible at low temperatures and exhibits high resistance to thermal stress.
The membrane compound is reinforced with a synthetic polyester non-woven fabric with continuous filament, high plasticity, elastic behavior and strength superior to
mechanical damage.
The bottom face is coated with Termotene® fusible film that facilitates unwinding and flame bonding to various substrates.
The particular formulation guarantees high mechanical performance when cold, flexibility at temperatures down to -25°C and excellent fatigue resistance.
Paraflex membranes do not contain asbestos, tar or other hazardous substances.
Although it is primarily used as a base layer, it can also be used as an air and vapor control layer (AVCL) within a constructed warm roof, subject to the use of the building below.

System Fire Testing:
BS EN 13501-5:2016 Classification Standard
Test Standard: CEN/TS 1187:2012
The determination of external fire performance is a test of the system that will be affected by the components within the roofing system.
Although Paraflex NT3 may be included in BROOF (t4) compliant systems, always check with your MOY technician.

The membrane will be laid in total adherence to the previous layer by flaming with a propane gas burner, creating lateral overlaps of at least 10cm and with head overlaps of at least 15cm.
All waterproof sheets must be staggered from each other, head overlaps of 4 sheets are not allowed.
In correspondence with unions, vents or all the elements equipped with a flange to be connected to the sealing element, it is advisable to lay a membrane gusset, glued to the previous layer and made with the same type of membrane as the sealing element, measuring 50x50cm, to be positioned below the flange of the element, so as to allow correct bonding of the bituminous membrane both on the overflowing part of the counter flange, and on the flange of the union and/or vent itself.
In order to avoid possible stagnation of water near the flange of the drain outlets, it is necessary to make an appropriate lowering of the surface in order to allow a correct flow of rainwater.

For any other specifications, refer to the manufacturer's data sheets.

The costs for cleaning and preparation of the base, cleaning for work purposes, compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner are included and compensated.

14.1.3. Thermal insulation layer in panels type MOY PARATHERM G PIR

Supply and installation of a thermal insulation layer made of thermosetting polyisocyanurate (PIR) thermal insulation panels, type MOY PARATHERM G: rigid panel for high-performance flat roofs, covered on both sides with a coated glass fabric, self-adhesive glued to the insulating core, certified fire reaction class B-s2, d0.
The thermal insulation layer must be correctly positioned within the roof stratigraphy, must comply with the design indications and installation directives specified in the current legislation (reference UNI 8178-2).

The installation of the insulating panels must be staggered in quincunxes: the panels must be positioned transversely to the direction of installation of the sealing element; the panels will be staggered from each other, taking care to always place them close together to avoid any thermal bridges.
The constraint of the insulating panels must comply with the design indications and installation directives specified in the current legislation (reference UNI 11442 and IGLAE Code of Practice).
The panels will be bound by total gluing on a double-sided adhesive vapour control element, by removing the monosiliconised film on the upper face.
The total thickness of the panel will be calculated according to the provisions of the current legislation in force.

Cutting and scrap are included and compensated, including all ancillary processes to give the product completely sealed and glued to the underlying structure, the costs for cleaning and preparation of the substrate, cleaning for the end of the work, compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

14.1.4. Waterproofing membrane type MOY PARAFLEX NT3

Supply and installation of MOY PARAFLEX NT3 type waterproofing membrane with "waterproof covering" function: it is an SBS polymer modified bitumen waterproofing membrane to be used as a base layer or air and vapor control layer, under waterproofing systems.
Paraflex remains flexible at low temperatures and exhibits high resistance to thermal stress.
The membrane compound is reinforced with a synthetic polyester non-woven fabric with continuous filament, high plasticity, elastic behavior and strength superior to
mechanical damage.
The bottom face is coated with Termotene® fusible film that facilitates unwinding and flame bonding to various substrates.
The particular formulation guarantees high mechanical performance when cold, flexibility at temperatures down to -25°C and excellent fatigue resistance.
Paraflex membranes do not contain asbestos, tar or other hazardous substances.
Although it is primarily used as a base layer, it can also be used as an air and vapor control layer (AVCL) within a constructed warm roof, subject to the use of the building below.

System Fire Testing:
BS EN 13501-5:2016 Classification Standard
Test Standard: CEN/TS 1187:2012

The determination of external fire performance is a test of the system that will be affected by the components within the roofing system.
Although Paraflex NT3 may be included in BROOF (t4) compliant systems, always check with your MOY technician.

The membrane will be laid in total adherence to the previous layer by flaming with a propane gas burner, creating lateral overlaps of at least 10cm and with head overlaps of at least 15cm.
All waterproof sheets must be staggered from each other, head overlaps of 4 sheets are not allowed.
In correspondence with unions, vents or all the elements equipped with a flange to be connected to the sealing element, it is advisable to lay a membrane gusset, glued to the previous layer and made with the same type of membrane as the sealing element, measuring 50x50cm, to be positioned below the flange of the element, so as to allow correct bonding of the bituminous membrane both on the overflowing part of the counter flange, and on the flange of the union and/or vent itself.
In order to avoid possible stagnation of water near the flange of the drain outlets, it is necessary to make an appropriate lowering of the surface in order to allow a correct flow of rainwater.

For any other specifications, refer to the manufacturer's data sheets.

The costs for cleaning and preparation of the base, cleaning for work purposes, compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner are included and compensated.

14.1.5. Controlit GS-Single Ply Leak Detection System

Supply and installation between the two waterproofing sheaths of a permanent testing and verification system specified by ASTM D7877-14; D8231-19.

Conductive layer for sealing the waterproof layer
Supply and installation, including scraps and overlaps, of the conductive layer CONTROLIT GS SINGLE PLY.
The operations will be carried out by a specialized company with personnel explicitly trained in such a way as to be able to allow, at the end of the installation, the final testing of the tightness of the waterproof layer using ELD (Electronic Leak Detection) electronic systems as per ASTM D7877-14 and ASTM D8231-19 standards internationally recognized.
The electrically conductive layer is designed to be laid over the entire area directly under the waterproofing membrane (PVC and TPO) mechanically fixed or not fixed.
The conductive layer will have the following characteristics:
- Made of type E fiberglass mesh with flat weave. Direct fabric titration (DIN EN 12654) with Warp EC 9-68 Z 20 and Weft EC 9-68 Z 20.
- Stainless steel nanoparticle coating.
- Electrical resistance Ohm/sq <1000 (as required by ASTM D7877-14 and ASTM D8231-19 testing standards).
- Fire resistance (EN 13501-1:2018) A2, s1- d0.
- Weight (DIN EN 12127 gr/sqm 165+/-10.

- Fuel content (DIN ISO 1887) 8.0-11.0%.
- Thickness (DIN EN ISO 5084) mm 0.16 +/- 0.02.
- Tensile strength (EN ISO 13934 1) N/5cm not less than: warp 2500, weft 2000.
- Black, dark grey colour.
- Dimensions 1650x50000 mm.
- Feathered edges.

The verification of the waterproof layer will be carried out either with HVMT (High Voltage Membrane Testing) technology as per par. 9 ASTM D7877-14, or with EFVM (Electronic Field Vector Mapping) technology as per par. 7 of the same standard or with roof scan technology as per ASTM D8231-19 standard.
The choice of technology will depend on the conditions in which the waterproof layer will be found at the time of testing. At the end of the works and in any case before the final testing, all the roofs must in any case be verified by the waterproof stratigraphy execution company as per the regulations in force, which is therefore not exempt from this responsibility. The periodic waterproofing check must be included in a roof maintenance plan in order to ensure that the waterproofing characteristics of the turf are maintained over time, intervening promptly on even minor injuries.

CONTROLIT Connection Point
Supply and installation of CONTROLIT Connection Points.
Stainless steel system for connecting the conductive layer to the equipment for integrity verification. Connection point consisting of a double fixing plate to the support and to the conductive layer, rod for elevation and complete set of sealing and locating material consisting of a flange to be welded to the waterproof membrane, heat-shrinkable sheath for sealing and plastic cap to completely close the system with yellow upper part for localization on the roof.
Specifications:
Dimensions: Ø rod 10mm;
pole height 198 mm;
plate thickness 2mm.
Weight gr. 165.
Material: stainless steel 1.4401.
Electrical resistance 740 nΩ*m.
Breaking load min. 580 kg.

PERMANENT ACTIVE MONITORING SYSTEM FOR THE TIGHTNESS OF WATERPROOF MEMBRANES (AS PER AS SIKB 6700 - PROT 6702, BRL-K908/02, ASTM D7909-14) CONNECTED TO CONTROLIT CONDUCTIVE LAYER (MANDATORY INSTALLATION IN ORDER TO ENSURE THE OPERATION OF THE SYSTEM)

Design, supply and installation of a continuous monitoring system for the tightness of waterproofing. Electrical monitoring system of the integrity of the waterproof membrane based on the principle of electrical insulation generated by the membrane itself (as per AS SIKB 6700 - PROT 6702, BRL-K908/02, ASTM D7909-14 standards) with certified sensors (for a duration of 100 years) suitable for installation even under heavy layers and with PH values between 1 and 14.
The system can be configured to interface with the building's BMS to send alarm signals based on tight-untight data evaluation in the reference area.

The system is able, through its sensors and data processing with the appropriate software, to detect the passage of minimal quantities of water as soon as they come into contact with the Controlit layer. The system is able to detect and locate the location of very small (approx. 1 mm2) damage to the waterproof membrane.
The data processing unit and the software constantly monitor the integrity of the waterproof membrane and, at the same time, thanks to the self-diagnosis system, the functionality of the various components is monitored.
System components:
Basic hardware for activation, processing, communication:
- MSS-CCU 16 Compact all-in-one measuring and data processing unit for indoor installation
- MSS rain sensor for activation of measurements
- WLAN/LAN router
MSS-ALA Software Module
- Data processing for each reading field (one coverage = one field = one software)
- Calculation and definition of the alarm position
- System status monitoring
- Sending alarms - Data exchange
MSS Source
- Low voltage (< 1V) and low intensity electric field generators on CONTROLIT conductive layer
MSS Single Sensor
- Sensor-collector of low-intensity electrical signals
Cables for connecting generators and sensors to the CCU
System installation, commissioning and testing

14.1.6. Waterproofing membrane type MOY PARAFLEX ARD/S

Supply and installation of a waterproof layer consisting of MOY Paraflex ARD/S type membrane: SBS polymer modified bitumen waterproofing membrane intended for all waterproofing.
The Paraflex range of waterproofing membranes are FM approved and can be used in new builds and renovation applications and are suitable for application in low temperature conditions.
Paraflex remains flexible at low temperatures and exhibits high resistance to thermal stress.
Paraflex ARD/S is manufactured with mineral slate or mineral stone granule coating on the top surface of the membrane in various colors, which offers UV protection and slip resistance.
The membrane compound is reinforced with continuous synthetic non-woven filament, polyester fabric, which allows plasticity, elastic behavior and superior resistance to mechanical damage.
The lower face is coated with Termotene® fusible film that helps unwinding and facilitates adhesion to the various substrates.
Paraflex membranes do not contain asbestos, tar or other hazardous substances.

System Fire Testing:
BS EN 13501-5:2016 Classification Standard
Test Standard: CEN/TS 1187:2012
The determination of external fire performance is a system test that will be influenced by the internal components of the roofing system.

Although Paraflex ARD/S may be included in BROOF (t4) compliant systems, always check with your MOY technician.

The membrane will be laid in total adherence to the previous layer by flaming with a propane gas burner, creating lateral overlaps of at least 10cm and with head overlaps of at least 15cm.
All waterproof sheets must be staggered from each other, head overlaps of 4 sheets are not allowed.
All the rolls of the second waterproof layer must be staggered from each other and with respect to the rolls of the first layer, laid parallel to those of the first layer with staggering of the side and head overlaps.

The costs for cleaning and preparation of the base, cleaning for work purposes, compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner are included and compensated.

15. EXTERNAL WORKS – HORIZONTAL STRATIGRAPHY

15.1. FL11 – Stratigraphy of pavement in self-locking pavement

Execution of the following works for new external sidewalk stratigraphy:

15.1.1. Compacted soil with backfilling of materials from excavations

Shaping of the soil with compaction of the substrate and the material coming from the excavations, by means of a leveller and subsequent compaction and rolling.

15.1.2. 3cm thick sand bedding layer

Formation of a bedding layer in sand of alluvial origin or from the crushing of rocks; with high mechanical resistance and not alterable, with a constant thickness of 3cm, adequately leveled with the function of receiving the cladding elements in self-locking blocks, compacted and flattened with metal screed
Granules obtained from grinding limestone or soft rocks are absolutely to be avoided as bedding materials.
The price includes and compensates for the costs for levelling, levelling, compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

15.1.3. Paving in self-locking concrete blocks type Favaro 1 model Galassia Filtrante

Supply and installation of self-locking vibro-compressed concrete blocks floor type Favaro 1 model Galassia Filtrante, supplied in four sizes with dimensions 7.4x22cm – 14.8x22cm – 22x22cm – 29x22cm, thickness 75mm, Carnic grey colour, to be sampled for approval by the D.L.
It is composed of a double layer with filtering mixtures.
The wear layer having a minimum thickness of 4 mm consisting of a mixture of quartz aggregates selected to give optimal performance of the walking surface.
Physical and mechanical characteristics according to the UNI EN 1338 standard, test methods applicable without the obligation of CE marking:
- tolerance on nominal thickness ±3 mm,
- abrasion resistance ≤20 mm,
- slip/slip resistance (USRV – average value) ≥68.
- R13 anti-slip classification according to DIN 51130,
- anti-slip classification C according to DIN 51097, compliant with the anti-slip requirements of Ministerial Decree 14/06/1989 n.236 for outdoor flooring.

Environmental sustainability characteristics: absence of asbestos, solar reflectance index SRI (for gray material or white-based colors) according to ASTM E1980 ≥29, minimum vertical permeability coefficient according to UNI CEN ISO/TS 17892-11 1.16x10-3k, 4176 mm/h, capable of disposing of 100% of the maximum rainfall levels of the project throughout the country, both in the short and long term.
Installed in accordance with the procedures indicated by the UNI 11241 standard, with the exception of the granulometric melt of the bedding sand and clogging, on ballast prepared according to the

type of traffic expected and the state of the natural soil on the basis of the indications of the "Catalogue for the sizing of pavements in urban areas" published by Assobeton, 2005: The materials used for the bedding layer and the ballast and their compaction conditions must in any case guarantee, in addition to the necessary load-bearing capacity, also permeability coefficients, even in the long term, such as to allow the regular filtration of surface water up to the level of catchment, or for total infiltration into the subsoil, on the basis of the design rainfall.

The price includes and compensates for the verification of the substrate, the laying on the sand bed, the cutting and scrapping, the compaction of the joints with sand and quartz aggregates, the cleaning and removal of the resulting material at the end of the work, the separate collection and transfer with transport to an authorized landfill of the resulting material, the landfill allowance, compliance with the CE and DOP marking for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

15.2. FL12 – Stratigraphy of green areas

Execution of the following processes, thickness about 33cm:

15.2.1. Compacted soil with backfilling of materials from excavations

Shaping of the soil with compaction of the substrate and the material coming from the excavations, by means of a leveller and subsequent compaction and rolling.

15.2.2. Anti-root membrane 15 polyester type Index Defend

Supply and installation of 4 mm thick elastoplastomeric polymer bitumen waterproofing membrane with phenoxy fatty acid ester anti-root additive, reinforced with composite polyester "non-woven fabric" stabilized with fiberglass type DEFEND ANTIRADICE 15 POLYESTER CE marked and certified as root-resistant by the FORSCHUNGSANSTALT GEISENHEIM according to the FLL-Verfahren, to be sampled for approval by the D.L.
The membrane will have the following technical characteristics:
- a tensile tensile strength (EN12311-1) L./T. of 700/500 N/50 mm,
- an elongation at break (EN 12311-1) L./T. of 40/40%,
- a dynamic punching resistance (EN 12691 method A) of 1,250 mm,
- a static puncture resistance (EN 12730) of 15 kg,
- a cold flexibility of -15°C and must pass the root resistance test in accordance with the European standard EN 13948.

The price includes the costs for the preparation of the fund, compliance with the CE and DOP marking for construction products provided for by Regulation no. 305/2011 (EU) and anything else to give the finished work in a workmanlike manner.

15.2.3. Growing medium about 30cm thick

Supply and installation of cultivation soil from areas with controlled agricultural use, free of stones, trunks, branches, roots and their parts that may hinder the agronomic processing of the soil after installation.

Unless otherwise specified in the design documents or by the D.L., it must have a texture defined as "medium texture" or "sandy-silty", having the following reference characteristics:

- Skeleton (particles > 2 mm.) < 5%;
- Silt < 40% - clay < 20%;
- PH between 5.5/7;
- C/N ratio between 3/15;
- Organic matter (dry weight) > 1.5%.
- Total limestone less than 25% and active limestone less than 3.5%

The quantity of skeleton with a diameter greater than 2mm must not exceed 20% of the total volume, while the skeleton with a diameter greater than 4cm must be eliminated through screening.
The presence of clay must be less than 50% certifiable with particle size analysis performed with a skid steer loader and manual assistance.
The cultivated land must be free of toxic substances and pathogens, polluting materials, in particular heavy metals and hydrocarbons, roots, rhizomes, tubers and weed seeds, pebbles, shards, etc., and must be submitted to the approval of the D.L. which may also require any analysis by a laboratory of proven technical reliability.
The cultivation substrates of mineral and/or vegetable origin will be used individually or mixed in proportions known for particular uses and to obtain a growing environment suitable for the different species to be planted.
The mixed and complex mineral and organic fertilizers to be used must have a declared title according to the provisions of the law in force.

The supply of cultivation soil, transport, spreading, rolling, digging of the soil carried out by hand or by machine, the digging of holes in the ground carried out for the planting of plants, the cleaning of the area with collection and storage in place of the resulting material, complete with any work in order to ensure the permeability of the soil and anything else necessary to give the finished work in a workmanlike manner, are included and compensated.

15.2.4. Pre-cultivated turf

Supply and installation of new turf, pre-cultivated, with a thickness of the root system such that it allows rapid liberation when planted, or with sowing by mechanical processing up to 30 cm.
Included and compensated are the transport and planting if with pre-cultivated clods or the sowing by spreading or with a self-propelled vehicle, the covering of seeds, the rolling of the soil and first wetting, the cutting carried out by machine and shredding of weeds and spontaneous vegetation, the trimming of grasses overflowing from the cordons, on the pavement adjacent to the cordons, disposal charges, the performance of all means of processing, traction, the necessary labour and water supply, the costs for the handling of materials within the construction site up to the laying surface, the preparation of the bottom, the work surfaces, all accessories and hardware necessary for installation, the disposal of the resulting materials at the Authorised Landfills, and every burden to give the finished work in a perfect workmanlike manner.

15.3. FL13 – Stratigraphy of internal roads and parking lots

Execution of the following works for new stratigraphy of internal roads and parking lots:

15.3.1. Preparation of the laying surface

Preparation of the embankment laying plan, including excavation and discotication to an average depth of 30cm, after cutting trees and bushes, uprooting stumps, loading, transport to authorized landfills or reuse of the resulting materials, also with possible deposit and recovery.
Supply of the materials necessary for the construction of the work, including transport up to 5 km from the place of extraction, compacting of the bottom of the excavation until the prescribed density is reached; filling of the excavation and compaction of the materials used, until the levels of the pre-existing soil and the prescribed compaction are reached.

15.3.2. Stabilized granular mix H 40cm approx.

Road foundation in granular mixture stabilized with natural binder, including the possible supply of filler materials or screening to achieve the suitable grain size, water, laboratory tests, processing and compaction of the layer with suitable machines.
Including the supply of the filler material, screening to reach the suitable particle size, water for thickening, leveling and compaction of the layer, rolling with suitable machines up to a total thickness of about 40cm, compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

15.3.3. Bituminous conglomerate thickness H 10cm

Supply and installation of bituminous conglomerate per base layer as per technical standards, including any charges, measured after compaction.
Paved with a vibratory paver and variable set-up in perfect working order according to current regulations and any indications of the works management, including rolling with static or vibrating roller with suitable compacting effect, measured after compaction.
Thickness of 10cm.

15.3.4. Binder thickness 5cm

Supply and installation of high-performance basebinders in bituminous conglomerate consisting of aggregates, grits and crushed stones, D max 20 mm, resistance to fragmentation LA ≤ 25, including up to a maximum of 30% of milled material regenerated with functional chemical activators (regenerating), hot mixed with normal class 50/70 or 70/100 bitumen, minimum dosage of total bitumen of 4.0% on a mixture with the addition of adhesion-activating additive ("dopes" of adhesiveness) and high additives with low molecular weight polymer compound and medium melting point added directly during the production phase in the mixer (dosage 4.0%-6.0% of the total bitumen weight); with a percentage of voids in place between 3% and 6%.
This includes site cleaning, application of 60% modified bituminous emulsion at the rate of 0.60-0.80 kg/m², paving by mechanical paver and compaction by means of rollers of suitable weight.
The bituminous mixture can be produced in lukewarm, with any technology or additive, as long as the same performance as the hot one is met.
For compressed thickness 5cm.

All the studies of the mixtures concerning the works reported in the Technical Tender Standards carried out by the executing companies must be submitted to the Works Management well in advance of the start of the works and approved by the same DL. In any case, the acknowledgment of these will not relieve the Company of its responsibility for obtaining the prescribed final performance results.

15.3.5. Binder connection layer, approx. 3cm thick

Supply and installation of a connecting layer (binder) in bituminous conglomerate consisting of aggregates, grits and crushed stones, Dmax 16 mm, resistance to fragmentation LA ≤ 25, including up to a maximum of 30% of milled material regenerated with functional chemical activators (regenerating), hot mixed with normal class 50/70 or 70/100 bitumen, minimum dosage of total bitumen of 4.2% on a mixture with the addition of adhesion-activating additive ("dopes" of adhesiveness); with a percentage of voids in place between 3% and 6%.
This includes site cleaning, application of 55% bituminous emulsion at the rate of 0.60-0.80 kg/m², paving by mechanical paver and compaction by means of rollers of suitable weight. The bituminous mixture can be produced in lukewarm, with any technology or additive, as long as the same performance as the hot one is met.
For compressed thickness 3cm.

The price includes the costs of verifying the driveability of the restored asphalt pavement; compliance with the CE and DOP marking for construction products provided for by Regulation no. 305/2011 (EU) and anything else to give the finished work in a workmanlike manner.

15.3.6. Layer of asphalt, approx. 3cm thick

Supply and installation of a surface layer in bituminous conglomerate consisting of aggregates, grits and crushed stones, Dmax 10.00 mm, resistance to fragmentation LA ≤ 20 and resistance to sanding PSV ≥ 44, including up to a maximum of 20% of regenerated milled material with functional chemical activators (regenerating), hot mixed with normal bitumen class 50/70 or 70/100, minimum dosage of total bitumen of 4.8% on a mixture with the addition of adhesion-activating additive ("dopes" of adhesiveness); with a percentage of voids in situ between 3% and 6%, surface adhesion value BPN ≥ 62.
This includes site cleaning, application of 55% bituminous emulsion at the rate of 0.60-0.80 kg/m², paving by mechanical paver and compaction by means of rollers of suitable weight. The bituminous mixture can be produced in lukewarm, with any technology or additive, as long as the same performance as the hot one is met.
For medium compacted thickness: 30 mm.
The price includes the costs of verifying the driveability of the restored asphalt pavement; compliance with the CE and DOP marking for construction products provided for by Regulation no. 305/2011 (EU) and anything else to give the finished work in a workmanlike manner.

16. SCREEDS

16.1. Generality

This technical specification concerns the quality of the materials, the construction methods and the acceptance criteria for the construction of the different stratifications that make up the "flooring" system.
The floors will be laid, predominantly, in highly stressed environments, therefore the coating layer must have a high degree of resistance to wear and abrasion, strong mechanical resistance, high behaviour to chemicals and stains and maximum adhesion to the substrate.
Coating materials:
Porcelain
Single cooking
Marble and natural stone

16.2. Method of execution

Charges and obligations of the Contractor included in the supply on site.
Before the start of the installation of the materials, it will be the responsibility of the Contractor to verify that the environmental conditions of the construction site, as regards internal temperature and humidity, do not represent a risk of degradation of the material and finishes.
This inspection must be carried out promptly so that any necessary restoration work can be carried out in time to comply with the work schedule.
Supply of materials, unless otherwise decided at the time of ordering.
Transport, unloading, storage, protection and custody of materials in environments prepared by the Contractor.
Various transport equipment from the warehouse to the place of use.
Equipment, specialized and ordinary labor for the installation of materials.
Rooms suitable for: shelter, changing room, refectory, etc. for the Contractor's staff, as required by current health and safety regulations in the workplace.
Power and water lines from existing on-site gripping points to user tools.
The filling, and the supply and fixing of any metal elements placed in the castings, anchors, fasteners and other inserts.
Cleaning and all the necessary protections to avoid any and all damage to the finished works.
The restoration of any works damaged during the installation of materials.
The transport from the places of installation and the stacking within the construction site, in a fenced area, previously indicated by the Works Management, of the waste and waste materials. The transport of the same to the disposal sites, including all related charges and practices.
The cleaning of the areas used for the stacking of materials and waste.
Photographic documentation illustrating the various processing phases and particularly relevant aspects that can no longer be inspected visually (with particular reference to the screeds made to protect radiant elements placed under the floor).

Obligations to be observed in the execution of screeds
During the execution of the screeds, the necessary measures must be taken to avoid any damage due to mechanical and meteorological actions.

In particular, it is prescribed to suspend the execution of the same in anticipation of a drop in temperature below 0°C.

Method of installation

The screeds in general will be made according to the provisions of the project and the Works Management.

The castings of the screeds must be made with the interposition of metal mesh consisting of round bars with a diameter of 4 mm and steel type Fe B 38k, with meshes of 10x10 cm, taking care to overlap the panels by at least two meshes and tying the sheets together with steel wire.

The mesh panels must be raised to the well-cleaned laying surface by means of plastic spacers for at least 1 cm in an ordinary environment and at least 2 cm in an aggressive environment.

The mesh will be placed in the center of the thickness either downwards or upwards according to the indications of the Works Management.

In correspondence with corners, sides, holes for technological passages, structural joints, etc., the reinforcement must be adequately reinforced to counteract the action of the greater tensions and settlements to which these areas are stressed.

As an alternative to reinforcement with electro-welded meshes, steel or polypropylene fibers can be used.

The concrete layer of the required thickness will then be poured, which must be well stepped on so that the mixture is well compacted and penetrates below the reinforcement.

The upper surface of the screed must be levelled with a fine trowel.

The concrete must not be cast on site from a height of more than 1.00 m.

The upper surface of the screed must be coplanar and well leveled and, uniformly, of the required thickness.

This includes the burden, where necessary according to the indications of the Works Management, of the formation of expansion joints, which must be made by interrupting the continuity of the reinforcement network and with shapes and reinforcements designed to avoid any differential settlements between one field and another.

The fields must not exceed 25 square meters and the position of the joints must be deduced from special design documents or from indications from the Works Management in order to avoid inappropriate placements with respect to the overlying flooring.

This screed must be cast on site with the preparation of sides and height references and must have a curing time of approx. 10 days before the installation of any overlying pavements.

During the construction of the screed, the formation of lesions must be avoided with the use of anti-shrinkage additives or with the preparation of longitudinal and transverse joints in the case of large surfaces.

Other processing arrangements

Suitability of the substrate: before starting the work, check the laying surface, by accurately surveying the dimensions in order to verify the possibility of creating the screed as required by the project graphics. The substrate must be free of additives, sawdust, oils, greases, paints, waxes, tobacco and cigarette residues, nails, construction site waste, dust.

Application of waterproofing: where the surface has strong roughness, smooth the laying surface with cement mortar. Treat the laying surface and the vertical contour surfaces with a coat of bituminous primer to fix their dust removal. Apply the sheathing by turning them over on the vertical

surfaces for a height equal to the height of the entire flooring package. In the case of screeds for shower and toilet floors, always provide a sheet of waterproof sheathing 4 mm thick under the distribution layer or under the insulating layer, turned over on the vertical surfaces for a height equal to at least the thickness of the finished floor.
Laying the insulating mat: store the panels indoors and in a dry place; the installation of wet panels will not be allowed. Lay the panels dry, taking care of the combination of the joints.
Vapour barrier or separation layer: spread the polyethylene rolls over the insulating panels, taking care to minimise the cuts of the sheets, making them turn over the vertical boundary surfaces, for a height equal to the thickness of the floor package.
Divider layer: Prepare the casting area by dividing it into fields (see above). In particular, the following must be provided: a separation joint from the structures with a width of 1 m, interposing between the screed and the perimeter walls and the vertical structures a sheet of expanded polystyrene with a low density of height equal to the flooring package; joints in correspondence with the expansion and/or seismic joints of the structure of dimensions equal to their width. Technical expansion joints, relative to the cladding layer as shown in the project drawings. Changes to the design of the joints dictated by the needs of the construction site must be agreed with the Works Management.

16.3. Reference legislation

- UNI 10329:2018 Paving screeds – Methods of measuring moisture
- UNI EN 13813:2004 Screeds and materials for screeds – Materials for screeds – Properties and requirements
- UNI EN 13318:2002 Screeds and materials for screeds – Definitions
- Royal Decree 16/11/39 n° 2234 appendix 1 "Rules for the acceptance of flooring materials"

16.4. Acceptance Requirements

For each batch of materials that it will use in the preparation of the products, the Contractor must provide the Works Management with the relevant certificate of origin valid for one year from the date of issue or from the test certificates issued by official laboratories, in particular for tests relating to the physical-mechanical characteristics.
The supply must be accompanied by the production mark that can be found on the appropriate label on the packaging.

16.5. Performance Specifications

The following list shows a series of screeds with characteristics suitable for different types of use:

- Insulating screed in cementitious conglomerate, must be made with type "325" cement and insulating mineral materials to be installed on subfoundations, abutments, floors and slabs, with adequate compaction of the conglomerate and formation of homogeneous slopes and an average final thickness of 50 mm.

- Screed for substrates of thin floors (tiles, resilient, etc.) with a thickness of not less than 35 mm made with concrete dosed at 350 kg of "325" cement per cubic metre of mixture complete with levelling, vibration, fittings and formation of joints where necessary.
- Screed for indoor floor substrates: about 6 cm thick, with the formation of the laying surface, pulled with a long trowel, mixture of 350 kg of 32.5 R cement, pulled to a perfect surface.

16.6. Sampling/testing methods

Relating to individual components

The Works Manager has the right to request an acceptance check, with the aim of ascertaining whether the materials to be installed have the characteristics declared by the Manufacturer.
The Works Management and the Tester reserve the right to have samples and samples of materials carried out, as well as for legal checks, also for checks during construction.
The costs relating to the execution of the above tests will be borne by the Contractor.

Relating to components and systems in place

Where required by the project or by the Works Management, the approval of the samples referred to in the previous paragraph is in any case subject to the simultaneous approval of the components and systems made on site in order to assess the suitability and relationship between them.

16.7. Tests

The following tests will be carried out.
Provisional testing
The screeds will be subjected to checks to verify the following characteristics and/or performance.
Physical/mechanical requirements:
Acceptance control of the distribution layer:
The acceptance control is represented by two samples, measuring cm. 10x10x10, carried out on a maximum of 100 square meters of casting of the distribution layer and in any case, for smaller quantities, every day of casting;
the samples must be taken one in the morning and one in the afternoon, agreeing on the times with the Works Management;
the control will be positive when the average strength of the two specimens is not less than 120 Kg/cm2 and in any case the lower result must not be less than 100 Kg/cm2.
Construction requirements:
Flatness check:
Carried out with a 4-metre metal ruler resting on the surface of the divider layer, the deviations of the real plane from the theoretical one, measured by inserting a graduated stainless steel wedge, must not exceed the values shown in the following table:

Distance between contact points		Meters		0,1	1,00	4,00	10,00
Maximum level difference allowed	Mm	1	3	9	12		
Allowed approximation on reading	0.5 mm.						

Final testing

It will consist of verifying that any requirements made during the provisional testing have been complied with and that the works do not show any degradation.

16.8. FL09 – Self-levelling smoothing for cementitious substrates – EXTERNAL CABINS

Supply and installation on stratigraphy at the expense of Progetto Strutture, of self-levelling smoothing for interiors, through the supply and installation of self-levelling cementitious product with rapid setting for thicknesses from 1 to 10mm, on clean, dry, healthy, compact substrates and possibly consolidated or primed with suitable products.
The levelling material must have the following peculiar characteristics:

- pH of the dough: approx. 12
- Walkability: 3 hours
- Compressive strength (N/mm2): 35.0 (at 28 days)
- Modulus of rupture and breaking strength (N/mm2): 8.0 (at 28 days)
- Abrasion resistance (g) Taber abrasimeter - H22 grinding wheel - 550 g - 200 rpm: 1.2 (at 28 days)
- Thickness (mm): 10

The price includes the costs for the preparation of the base, the preservation of the openings of the passage of the systems, the level run with the beaten and compacted laying surface, the fine trowel of the surface suitable for receiving the laying of the next layer, the verification of the suitable moisture content, compliance with the CE and DOP marking for construction products provided for by Regulation no. 305/2011 (EU) and anything else to give the finished work in a workmanlike manner.

17. INTERNAL STRATIGRAPHY

See table Horizontal stratigraphy abacus

17.1. FL01 - Stratigraphy for offices – GROUND FLOOR

Stratigraphy laid on compacted soil, final thickness about 50cm, having the following composition:

17.1.1. Stabilized granular mix th. 20cm approx.

Supply, laying and rolling of a stabilized mixed granular substrate consisting of river or crusher gravels, non-frosting, grain size 0.40/0.50 and natural binder, according to UNI EN 13242:2008 standard, thickness about 20cm, including the supply of the filler material, screening to reach the suitable grain size, water for thickening, leveling and compaction of the layer, rolling with suitable machines up to the thickness established by the project, compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

17.1.2. Separation layer made of polyethylene sheets

Supply and installation of a separation layer, made of LDPE low-density polyethylene, transparent in colour, with a nominal thickness of 0.10 mm and cold micro-perforation of the surface that makes it permeable to vapour, free from glues or resins.
Dry laid overlapping on the joints of at least 10 cm.
The sheet must have the technical characteristics duly certified and accepted by the D.L.

- Areic mass EN 1849-2 (kg/m2) 0.10 (±10%)
- Average nominal thickness EN 1849-2 (mm) 0.10 (±15%)
- Vapor diffusion resistance EN 1931 (μ) ≤10000
- Resistance to vapour diffusion Value Sd (m) (μ x d) 10000 x 0.0001 = 1
- Elongation at breaking point ISO 527-3 (%) ≥250%
- ISO 527-3 Tensile Strength (MPa) ≥17

The price includes and compensates for the costs for cutting, scrap, flaps, compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

17.1.3. Insulating panel type Foamglass Floor Board T4, th. 100mm

Supply and installation of an insulating panel such as Foamglass Floor Board T4 or similar to be submitted to the approval of the D.L., 100mm thick, consisting of glued Foamglas T4+ sheets, produced from highly selected recycled glass and raw materials particularly abundant in nature; Completely inorganic, it contains no propellants, flame retardant additives or binders.
The upper part is covered with a layer of green fiberglass reinforcement and the lower part with a white veil.

Waterproof, resistant to pests, compression, acids, non-combustible, vapour-resistant, stable in shape, environmentally friendly, with radone gas protection, easy to process, with the following technical characteristics according to EN 13167:

- Apparent specific gravity (± 10%) (EN 1602): 115 kg/m3
- Thermal conductivity (EN ISO 10456): λD ≤ 0.041 W/(m·K)
- Fire behaviour (EN 13501-1): Euroclass E (cellular glass in accordance with Euroclass A1)
- Point load (EN 12430): PL ≤ 1.5 mm
- Compressive strength (EN 826 Annex A): CS ≥ 600 kPa
- Modulus of rupture and breaking strength (EN 12089): BS ≥ 450 kPa
- Tensile strength (EN 1607): TR ≥ 150 kPa
- Resistance to vapour diffusion μ = ∞ (EN ISO 10456)

Laid and sealed with hot bitumen or cold adhesive at the choice of the D.L. and following the instructions of the supplier.

Cutting and scrap are included and compensated, including all ancillary processes to give the product completely sealed and glued to the underlying structure, the costs for cleaning and preparation of the substrate, cleaning for the end of the work, compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

17.1.4. High-density polyethylene foil vapour barrier

Supply and installation of a vapour barrier for protection against rising humidity, made of high-density polyethylene HDPE, impermeable to water vapour, having the following main technical characteristics:

- Nominal thickness: 200 μm
- Water vapour resistance - SD (WVTV): Sd = > 75 m

Laid dry by surmounting the sheets for 10 cm, fixing the joints of the overlaps using high-strength aluminized tape, with a thickness of 5cm H and 1mm, specific for sealing the sheets together ensuring the continuity of the vapour barrier.
The price includes and compensates the costs for cutting, scrap, overlapping, the tape for joining the overlaps, compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

17.1.5. Lightened screed approx. 13cm thick

Supply and installation of lightened screed hanging where necessary, variable thickness according to stratigraphy, consisting of premixed based on expanded clay and specific binders and additives, with controlled shrinkage.
Mechanically executed and pumped on site.
Well compacted and levelled data on site, having the following technical characteristics:
Density approx. 1,000 kg/m3,

Average certified compressive strength 12 N/mm2,
Certified thermal conductivity λ 0.251 W/mK,
Walkability: 24 hours from installation
Water vapour resistance factor (UNI EN ISO 10456): μ 8 (DRY FIELD)
Reaction to fire: Euroclass A1fl (non-combustible)
CE marked according to UNI EN 13813 and Anab-Icea certified for green building.
Supplied in bags, mixed with water according to the manufacturer's instructions, stretched, beaten, flattened and smoothed.

The costs for cleaning and preparation of the base, beating, piling, vibrating, mechanical or hand compaction, etc., are included and compensated; the charges for the formation of slopes connected to the collection points as per the project drawing, the charges for the establishment of the openings for the passage of the plants; the insulation joints made of 1cm thick compressible material along the perimeter of the rooms and around the pillars, the creation of joints in correspondence with any existing ones, the level pulling, the fine trowel of the surface suitable for receiving the installation of the ceramic finish; compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

17.1.6. Primate Phonomax type anti-impact acoustic mat 10mm thick

Supply and installation of a hinged mat suitable for impact sound insulation type Primate Phonomax or similar to be sampled and submitted to the approval of the D.L., thickness 10mm, in chemically cross-linked closed-cell polyethylene foam chemically coupled with Phonotek heat-bonded polyester fiber with high grammage, laid after decoupling the perimeter walls of the screed by laying an adhesive perimeter band type Primate Phonoper in cell-shaped polyethylene foam closed, with a special "milled" for an easy "L" laying, 5mm thick, avoiding the vertical flap of the mat which will have the following main technical characteristics:

- Reaction to fire class UNI EN 13501-1: class E
- Dynamic stiffness s': 11-19 MN/m3 (UNI EN 29052-1)
- Impact noise reduction ΔLw dB 36 (UNI EN ISO 12354-2 UNI TR 11175)
- Compressive strength, UNI EN 826: 13 kPa
- Density: 30 kg/mc (UNI EN 1602)

The sheets must be carefully approached using the rebate and joined with Primate Phonojoin type joint tape, a low-thickness adhesive tape for taping the joints and overlaps of the acoustic mats. Made of chemically cross-linked closed-cell polyethylene foam, coupled on the upper face with embossed aluminized PET film and on the lower face with anti-stretching adhesive screening. Thickness 1.8mm; height 5cm.
The preparation and cleaning of the bottom, cutting, scraping, supply and installation of the perimeter strip in order to avoid the formation of acoustic bridges, the sealing of all joints, compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner are included and compensated.

17.1.7. Reinforced sand and cement screed, 6cm thick

Supply and installation of reinforced screed, in sand and cement, about 6cm thick, made of cement conglomerate, machine-packed, dosed at least 300Kg of R325 type cement per cubic meter of aggregate with regulatory grain size with a strength greater than Rck = 20 N/mm2.
Mechanically executed and pumped on site, reinforced with electro-welded mesh consisting of FeB44k steel rods with a diameter of 6mm with a 10x10cm mesh.
Well compacted and leveled.

The costs for cleaning and preparation of the base, beating, piling, vibrating, mechanical or hand compaction, etc., are included and compensated; the charges for the formation of the slopes connected to the collection points as per the project drawing, the charges for the formation of the recess for the installation of the recessed doormat; the insulation joints made of compressible material 1cm thick along the perimeter of the rooms and around the pillars, the construction of joints in correspondence with any existing ones, the level run; the fine trowel of the surface, compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

17.1.8. Carpet tile finish

Finishing in carpet tiles, see chapter Floors and Walls.

17.2. FL02 - Stratigraphy for wet rooms – GROUND FLOOR

Stratigraphy laid on compacted soil, final thickness about 50cm, for ground floor bathrooms, having the following composition:

17.2.1. Stabilized granular mix th. 20cm approx.

Supply, laying and rolling of a stabilized mixed granular substrate consisting of river or crusher gravels, non-frosting, grain size 0.40/0.50 and natural binder, according to UNI EN 13242:2008 standard, thickness about 20cm, including the supply of the filler material, screening to reach the suitable grain size, water for thickening, leveling and compaction of the layer, rolling with suitable machines up to the thickness established by the project, compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

17.2.2. Separation layer made of polyethylene sheets

Supply and installation of a separation layer, made of LDPE low-density polyethylene, transparent in colour, with a nominal thickness of 0.10 mm and cold micro-perforation of the surface that makes it permeable to vapour, free from glues or resins.
Dry laid overlapping on the joints of at least 10 cm.
The sheet must have the technical characteristics duly certified and accepted by the D.L.

- Areic mass EN 1849-2 (kg/m2) 0.10 (±10%)
- Average nominal thickness EN 1849-2 (mm) 0.10 (±15%)
- Vapor diffusion resistance EN 1931 (μ) ≤10000

- Resistance to vapour diffusion Value Sd (m) (μ x d) 10000 x 0.0001 = 1
- Elongation at breaking point ISO 527-3 (%) ≥250%
- ISO 527-3 Tensile Strength (MPa) ≥17

The price includes and compensates for the costs for cutting, scrap, flaps, compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

17.2.3. Insulating panel type Foamglass Floor Board T4, th. 100mm

Supply and installation of an insulating panel such as Foamglass Floor Board T4 or similar to be submitted to the approval of the D.L., 100mm thick, consisting of glued Foamglas T4+ sheets, produced from highly selected recycled glass and raw materials particularly abundant in nature; Completely inorganic, it contains no propellants, flame retardant additives or binders.
The upper part is covered with a layer of green fiberglass reinforcement and the lower part with a white veil.
Waterproof, resistant to pests, compression, acids, non-combustible, vapour-resistant, stable in shape, environmentally friendly, with radone gas protection, easy to process, with the following technical characteristics according to EN 13167:

- Apparent specific gravity (± 10%) (EN 1602): 115 kg/m3
- Thermal conductivity (EN ISO 10456): λD ≤ 0.041 W/(m·K)
- Fire behaviour (EN 13501-1): Euroclass E (cellular glass in accordance with Euroclass A1)
- Point load (EN 12430): PL ≤ 1.5 mm
- Compressive strength (EN 826 Annex A): CS ≥ 600 kPa
- Modulus of rupture and breaking strength (EN 12089): BS ≥ 450 kPa
- Tensile strength (EN 1607): TR ≥ 150 kPa
- Resistance to vapour diffusion μ = ∞ (EN ISO 10456)

Laid and sealed with hot bitumen or cold adhesive at the choice of the D.L. and following the instructions of the supplier.

Cutting and scrap are included and compensated, including all ancillary processes to give the product completely sealed and glued to the underlying structure, the costs for cleaning and preparation of the substrate, cleaning for the end of the work, compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

17.2.4. High-density polyethylene foil vapour barrier

Supply and installation of a vapour barrier for protection against rising humidity, made of high-density polyethylene HDPE, impermeable to water vapour, having the following main technical characteristics:

- Nominal thickness: 200 μm
- Water vapour resistance - SD (WVTV): Sd = > 75 m

Laid dry by surmounting the sheets for 10 cm, fixing the joints of the overlaps using high-strength aluminized tape, with a thickness of 5cm H and 1mm, specific for sealing the sheets together ensuring the continuity of the vapour barrier.
The price includes and compensates the costs for cutting, scrap, overlapping, the tape for joining the overlaps, compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

17.2.5. Lightened screed, approx. 12cm thick

Supply and installation of lightened screed hanging where necessary, variable thickness according to stratigraphy, consisting of premixed based on expanded clay and specific binders and additives, with controlled shrinkage.
Mechanically executed and pumped on site.
Well compacted and levelled data on site, having the following technical characteristics:
Density approx. 1,000 kg/m3,
Average certified compressive strength 12 N/mm2,
Certified thermal conductivity λ 0.251 W/mK,
Walkability: 24 hours from installation
Water vapour resistance factor (UNI EN ISO 10456): μ 8 (DRY FIELD)
Reaction to fire: Euroclass A1fl (non-combustible)
CE marked according to UNI EN 13813 and Anab-Icea certified for green building.
Supplied in bags, mixed with water according to the manufacturer's instructions, stretched, beaten, flattened and smoothed.

The costs for cleaning and preparation of the base, beating, piling, vibrating, mechanical or hand compaction, etc., are included and compensated; the charges for the formation of slopes connected to the collection points as per the project drawing, the charges for the establishment of the openings for the passage of the plants; the insulation joints made of 1cm thick compressible material along the perimeter of the rooms and around the pillars, the creation of joints in correspondence with any existing ones, the level pulling, the fine trowel of the surface suitable for receiving the installation of the ceramic finish; compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

17.2.6. Primate Phonomax type anti-impact acoustic mat 10mm thick

Supply and installation of a hinged mat suitable for impact sound insulation type Primate Phonomax or similar to be sampled and submitted to the approval of the D.L., thickness 10mm, in chemically cross-linked closed-cell polyethylene foam chemically coupled with Phonotek heat-bonded polyester fiber with high grammage, laid after decoupling the perimeter walls of the screed by laying an adhesive perimeter band type Primate Phonoper in cell-shaped polyethylene foam closed, with a special "milled" for an easy "L" laying, 5mm thick, avoiding the vertical flap of the mat which will have the following main technical characteristics:

- Reaction to fire class UNI EN 13501-1: class E
- Dynamic stiffness s': 11-19 MN/m3 (UNI EN 29052-1)

- Impact noise reduction ΔLw dB 36 (UNI EN ISO 12354-2 UNI TR 11175)
- Compressive strength, UNI EN 826: 13 kPa
- Density: 30 kg/mc (UNI EN 1602)

The sheets must be carefully approached using the rebate and joined with Primate Phonojoin type joint tape, a low-thickness adhesive tape for taping the joints and overlaps of the acoustic mats. Made of chemically cross-linked closed-cell polyethylene foam, coupled on the upper face with embossed aluminized PET film and on the lower face with anti-stretching adhesive screening. Thickness 1.8mm; height 5cm.
The preparation and cleaning of the bottom, cutting, scraping, supply and installation of the perimeter strip in order to avoid the formation of acoustic bridges, the sealing of all joints, compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner are included and compensated.

17.2.7. Sand and cement reinforced screed, about 6cm thick

Supply and installation of reinforced screed, in sand and cement, about 6cm thick, made of cement conglomerate, machine-packed, dosed at least 300Kg of R325 type cement per cubic meter of aggregate with regulatory grain size with a strength greater than Rck = 20 N/mm2.
Mechanically executed and pumped on site, reinforced with electro-welded mesh consisting of FeB44k steel rods with a diameter of 6mm with a 10x10cm mesh.
Well compacted and leveled.

The costs for cleaning and preparation of the base, beating, piling, vibrating, mechanical or hand compaction, etc., are included and compensated; the charges for the formation of the slopes connected to the collection points as per the project drawing, the charges for the formation of the recess for the installation of the recessed doormat; the insulation joints made of compressible material 1cm thick along the perimeter of the rooms and around the pillars, the construction of joints in correspondence with any existing ones, the level run; the fine trowel of the surface, compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

17.2.8. Waterproofing layer before laying the stoneware

See chapter Waterproofing.

17.2.9. Concrete-effect stoneware tile finish

Finish in concrete-effect stoneware tiles, see chapter Floor and Wall Tiles.

17.3. FL03 - Stratigraphy of the entrance/lobby area – GROUND FLOOR

Stratigraphy laid on compacted soil, final thickness about 50cm, having the following composition:

17.3.1. Stabilized granular mix th. 20cm approx.

Supply, laying and rolling of a stabilized mixed granular substrate consisting of river or crusher gravels, non-frosting, grain size 0.40/0.50 and natural binder, according to UNI EN 13242:2008 standard, thickness about 20cm, including the supply of the filler material, screening to reach the suitable grain size, water for thickening, leveling and compaction of the layer, rolling with suitable machines up to the thickness established by the project, compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

17.3.2. Separation layer made of polyethylene sheets

Supply and installation of a separation layer, made of LDPE low-density polyethylene, transparent in colour, with a nominal thickness of 0.10 mm and cold micro-perforation of the surface that makes it permeable to vapour, free from glues or resins.
Dry laid overlapping on the joints of at least 10 cm.
The sheet must have the technical characteristics duly certified and accepted by the D.L.

- Areic mass EN 1849-2 (kg/m2) 0.10 (±10%)
- Average nominal thickness EN 1849-2 (mm) 0.10 (±15%)
- Vapor diffusion resistance EN 1931 (μ) ≤10000
- Resistance to vapour diffusion Value Sd (m) (μ x d) 10000 x 0.0001 = 1
- Elongation at breaking point ISO 527-3 (%) ≥250%
- ISO 527-3 Tensile Strength (MPa) ≥17

The price includes and compensates for the costs for cutting, scrap, flaps, compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

17.3.3. Insulating panel type Foamglass Floor Board T4, th. 100mm

Supply and installation of an insulating panel such as Foamglass Floor Board T4 or similar to be submitted to the approval of the D.L., 100mm thick, consisting of glued Foamglas T4+ sheets, produced from highly selected recycled glass and raw materials particularly abundant in nature; Completely inorganic, it contains no propellants, flame retardant additives or binders.
The upper part is covered with a layer of green fiberglass reinforcement and the lower part with a white veil.
Waterproof, resistant to pests, compression, acids, non-combustible, vapour-resistant, stable in shape, environmentally friendly, with radone gas protection, easy to process, with the following technical characteristics according to EN 13167:

- Apparent specific gravity (± 10%) (EN 1602): 115 kg/m3
- Thermal conductivity (EN ISO 10456): λD ≤ 0.041 W/(m·K)
- Fire behaviour (EN 13501-1): Euroclass E (cellular glass in accordance with Euroclass A1)
- Point load (EN 12430): PL ≤ 1.5 mm
- Compressive strength (EN 826 Annex A): CS ≥ 600 kPa
- Modulus of rupture and breaking strength (EN 12089): BS ≥ 450 kPa

- Tensile strength (EN 1607): TR ≥ 150 kPa
- Resistance to vapour diffusion μ = ∞ (EN ISO 10456)

Laid and sealed with hot bitumen or cold adhesive at the choice of the D.L. and following the instructions of the supplier.

Cutting and scrap are included and compensated, including all ancillary processes to give the product completely sealed and glued to the underlying structure, the costs for cleaning and preparation of the substrate, cleaning for the end of the work, compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

17.3.4. High-density polyethylene foil vapour barrier

Supply and installation of a vapour barrier for protection against rising humidity, made of high-density polyethylene HDPE, impermeable to water vapour, having the following main technical characteristics:

- Nominal thickness: 200 μm
- Water vapour resistance - SD (WVTV): Sd = > 75 m

Laid dry by surmounting the sheets for 10 cm, fixing the joints of the overlaps using high-strength aluminized tape, with a thickness of 5cm H and 1mm, specific for sealing the sheets together ensuring the continuity of the vapour barrier.
The price includes and compensates the costs for cutting, scrap, overlapping, the tape for joining the overlaps, compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

17.3.5. Lightened screed approx. 11cm thick

Supply and installation of lightened screed hanging where necessary, variable thickness according to stratigraphy, consisting of premixed based on expanded clay and specific binders and additives, with controlled shrinkage.
Mechanically executed and pumped on site.
Well compacted and levelled data on site, having the following technical characteristics:
Density approx. 1,000 kg/m3,
Average certified compressive strength 12 N/mm2,
Certified thermal conductivity λ 0.251 W/mK,
Walkability: 24 hours from installation
Water vapour resistance factor (UNI EN ISO 10456): μ 8 (DRY FIELD)
Reaction to fire: Euroclass A1fl (non-combustible)
CE marked according to UNI EN 13813 and Anab-Icea certified for green building.
Supplied in bags, mixed with water according to the manufacturer's instructions, stretched, beaten, flattened and smoothed.

The costs for cleaning and preparation of the base, beating, piling, vibrating, mechanical or hand compaction, etc., are included and compensated; the charges for the formation of slopes connected

to the collection points as per the project drawing, the charges for the establishment of the openings for the passage of the plants; the insulation joints made of 1cm thick compressible material along the perimeter of the rooms and around the pillars, the creation of joints in correspondence with any existing ones, the level pulling, the fine trowel of the surface suitable for receiving the installation of the ceramic finish; compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

17.3.6. Primate Phonomax type anti-impact acoustic mat 10mm thick

Supply and installation of a hinged mat suitable for impact sound insulation type Primate Phonomax or similar to be sampled and submitted to the approval of the D.L., thickness 10mm, in chemically cross-linked closed-cell polyethylene foam chemically coupled with Phonotek heat-bonded polyester fiber with high grammage, laid after decoupling the perimeter walls of the screed by laying an adhesive perimeter band type Primate Phonoper in cell-shaped polyethylene foam closed, with a special "milled" for an easy "L" laying, 5mm thick, avoiding the vertical flap of the mat which will have the following main technical characteristics:

- Reaction to fire class UNI EN 13501-1: class E
- Dynamic stiffness s': 11-19 MN/m3 (UNI EN 29052-1)
- Impact noise reduction ΔLw dB 36 (UNI EN ISO 12354-2 UNI TR 11175)
- Compressive strength, UNI EN 826: 13 kPa
- Density: 30 kg/mc (UNI EN 1602)

The sheets must be carefully approached using the rebate and joined with Primate Phonojoin type joint tape, a low-thickness adhesive tape for taping the joints and overlaps of the acoustic mats. Made of chemically cross-linked closed-cell polyethylene foam, coupled on the upper face with embossed aluminized PET film and on the lower face with anti-stretching adhesive screening. Thickness 1.8mm; height 5cm.
The preparation and cleaning of the bottom, cutting, scraping, supply and installation of the perimeter strip in order to avoid the formation of acoustic bridges, the sealing of all joints, compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner are included and compensated.

17.3.7. Sand and cement reinforced screed, about 6cm thick

Supply and installation of reinforced screed, in sand and cement, about 6cm thick, made of cement conglomerate, machine-packed, dosed at least 300Kg of R325 type cement per cubic meter of aggregate with regulatory grain size with a strength greater than Rck = 20 N/mm2.
Mechanically executed and pumped on site, reinforced with electro-welded mesh consisting of FeB44k steel rods with a diameter of 6mm with a 10x10cm mesh.
Well compacted and leveled.

The costs for cleaning and preparation of the base, beating, piling, vibrating, mechanical or hand compaction, etc., are included and compensated; the charges for the formation of the slopes connected to the collection points as per the project drawing, the charges for the formation of the

recess for the installation of the recessed doormat; the insulation joints made of compressible material 1cm thick along the perimeter of the rooms and around the pillars, the construction of joints in correspondence with any existing ones, the level run; the fine trowel of the surface, compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

17.3.8. Stone-effect stoneware tile finish

Stone-effect stoneware tile finish, see chapter Floor and Wall Tiles.

17.4. FL05 - Stratigraphy for offices – FIRST FLOOR

Laid on stratigraphy by the Structures Project, final thickness about 20cm, having the following stratigraphy:

17.4.1. XPS insulating panel 5cm thick

Supply and installation of XPS insulating panels, single-layer extruded expanded polystyrene panels consisting of perfectly closed, uniform and homogeneous cells filled with gases with reduced environmental impact according to the latest international standards, with radon gas protection.
For thermal insulation, high mechanical resistance to compression, ease of cutting and installation.
The product should be stored indoors, in well-ventilated rooms and away from heat and ignition sources.

Specifications:
Declared thermal conductivity EN 12667: λD 0.036 W/(m·K)
Fire reaction class EN 13501-1: E
Resistance to water vapour diffusion μ = 80/100 (EN 12086)
Compressive strength with 10% strain EN 826: 200 kPa
Declared thermal resistance Rd 2.75mqK/W
Density: 30kg/mc
Installed following the instructions of the supplier.

Cutting and scrap are included and compensated, including all ancillary processes to give the product completely sealed and glued to the underlying structure, the costs for cleaning and preparation of the substrate, cleaning for the end of the work, compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

17.4.2. Separation layer made of polyethylene sheets

Supply and installation of a separation layer, made of LDPE low-density polyethylene, transparent in colour, with a nominal thickness of 0.10 mm and cold micro-perforation of the surface that makes it permeable to vapour, free from glues or resins.
Dry laid overlapping on the joints of at least 10 cm.
The sheet must have the technical characteristics duly certified and accepted by the D.L.
- Areic mass EN 1849-2 (kg/m2) 0.10 (±10%)

- Average nominal thickness EN 1849-2 (mm) 0.10 (±15%)
- Vapor diffusion resistance EN 1931 (μ) ≤10000
- Resistance to vapour diffusion Value Sd (m) (μ x d) 10000 x 0.0001 = 1
- Elongation at breaking point ISO 527-3 (%) ≥250%
- ISO 527-3 Tensile Strength (MPa) ≥17

The price includes and compensates for the costs for cutting, scrap, flaps, compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

17.4.3. Lightened screed, approx. 8cm thick

Supply and installation of lightened screed hanging where necessary, variable thickness according to stratigraphy, consisting of premixed based on expanded clay and specific binders and additives, with controlled shrinkage.
Mechanically executed and pumped on site.
Well compacted and levelled data on site, having the following technical characteristics:
Density approx. 1,000 kg/m3,
Average certified compressive strength 12 N/mm2,
Certified thermal conductivity λ 0.251 W/mK,
Walkability: 24 hours from installation
Water vapour resistance factor (UNI EN ISO 10456): μ 8 (DRY FIELD)
Reaction to fire: Euroclass A1fl (non-combustible)
CE marked according to UNI EN 13813 and Anab-Icea certified for green building.
Supplied in bags, mixed with water according to the manufacturer's instructions, stretched, beaten, flattened and smoothed.

The costs for cleaning and preparation of the base, beating, piling, vibrating, mechanical or hand compaction, etc., are included and compensated; the charges for the formation of slopes connected to the collection points as per the project drawing, the charges for the establishment of the openings for the passage of the plants; the insulation joints made of 1cm thick compressible material along the perimeter of the rooms and around the pillars, the creation of joints in correspondence with any existing ones, the level pulling, the fine trowel of the surface suitable for receiving the installation of the ceramic finish; compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

17.4.4. Primate Phonomax type anti-impact acoustic mat 10mm thick

Supply and installation of a hinged mat suitable for impact sound insulation type Primate Phonomax or similar to be sampled and submitted to the approval of the D.L., thickness 10mm, in chemically cross-linked closed-cell polyethylene foam chemically coupled with Phonotek heat-bonded polyester fiber with high grammage, laid after decoupling the perimeter walls of the screed by laying an adhesive perimeter band type Primate Phonoper in cell-shaped polyethylene foam closed, with a

special "milled" for an easy "L" laying, 5mm thick, avoiding the vertical flap of the mat which will have the following main technical characteristics:

- Reaction to fire class UNI EN 13501-1: class E
- Dynamic stiffness s': 11-19 MN/m3 (UNI EN 29052-1)
- Impact noise reduction ΔLw dB 36 (UNI EN ISO 12354-2 UNI TR 11175)
- Compressive strength, UNI EN 826: 13 kPa
- Density: 30 kg/mc (UNI EN 1602)

The sheets must be carefully approached using the rebate and joined with Primate Phonojoin type joint tape, a low-thickness adhesive tape for taping the joints and overlaps of the acoustic mats. Made of chemically cross-linked closed-cell polyethylene foam, coupled on the upper face with embossed aluminized PET film and on the lower face with anti-stretching adhesive screening. Thickness 1.8mm; height 5cm.
The preparation and cleaning of the bottom, cutting, scraping, supply and installation of the perimeter strip in order to avoid the formation of acoustic bridges, the sealing of all joints, compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner are included and compensated.

17.4.5. Sand and cement reinforced screed, about 6cm thick

Supply and installation of reinforced screed, in sand and cement, about 6cm thick, made of cement conglomerate, machine-packed, dosed at least 300Kg of R325 type cement per cubic meter of aggregate with regulatory grain size with a strength greater than Rck = 20 N/mm2.
Mechanically executed and pumped on site, reinforced with electro-welded mesh consisting of FeB44k steel rods with a diameter of 6mm with a 10x10cm mesh.
Well compacted and leveled.

The costs for cleaning and preparation of the base, beating, piling, vibrating, mechanical or hand compaction, etc., are included and compensated; the charges for the formation of the slopes connected to the collection points as per the project drawing, the charges for the formation of the recess for the installation of the recessed doormat; the insulation joints made of compressible material 1cm thick along the perimeter of the rooms and around the pillars, the construction of joints in correspondence with any existing ones, the level run; the fine trowel of the surface, compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

17.4.6. Carpet tile finish

Finishing in carpet tiles, see chapter Floors and Walls.

17.5. FL06 - Stratigraphy for wet rooms – FIRST FLOOR

Laid on stratigraphy by the Structures Project, final thickness about 20cm, having the following stratigraphy:

17.5.1. XPS insulating panel 5cm thick

Supply and installation of XPS insulating panels, single-layer extruded expanded polystyrene panels consisting of perfectly closed, uniform and homogeneous cells filled with gases with reduced environmental impact according to the latest international standards, with radon gas protection.
For thermal insulation, high mechanical resistance to compression, ease of cutting and installation.
The product should be stored indoors, in well-ventilated rooms and away from heat and ignition sources.

Specifications:
Declared thermal conductivity EN 12667: λD 0.036 W/(m·K)
Fire reaction class EN 13501-1: E
Resistance to water vapour diffusion μ = 80/100 (EN 12086)
Compressive strength with 10% strain EN 826: 200 kPa
Declared thermal resistance Rd 2.75mqK/W
Density: 30kg/mc
Installed following the instructions of the supplier.

Cutting and scrap are included and compensated, including all ancillary processes to give the product completely sealed and glued to the underlying structure, the costs for cleaning and preparation of the substrate, cleaning for the end of the work, compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

17.5.2. Separation layer made of polyethylene sheets

Supply and installation of a separation layer, made of LDPE low-density polyethylene, transparent in colour, with a nominal thickness of 0.10 mm and cold micro-perforation of the surface that makes it permeable to vapour, free from glues or resins.
Dry laid overlapping on the joints of at least 10 cm.
The sheet must have the technical characteristics duly certified and accepted by the D.L.

- Areic mass EN 1849-2 (kg/m2) 0.10 (±10%)
- Average nominal thickness EN 1849-2 (mm) 0.10 (±15%)
- Vapor diffusion resistance EN 1931 (μ) ≤10000
- Resistance to vapour diffusion Value Sd (m) (μ x d) 10000 x 0.0001 = 1
- Elongation at breaking point ISO 527-3 (%) ≥250%
- ISO 527-3 Tensile Strength (MPa) ≥17

The price includes and compensates for the costs for cutting, scrap, flaps, compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

17.5.3. Lightened screed, approx. 7cm thick

Supply and installation of lightened screed hanging where necessary, variable thickness according to stratigraphy, consisting of premixed based on expanded clay and specific binders and additives, with controlled shrinkage.
Mechanically executed and pumped on site.
Well compacted and levelled data on site, having the following technical characteristics:
Density approx. 1,000 kg/m3,
Average certified compressive strength 12 N/mm2,
Certified thermal conductivity λ 0.251 W/mK,
Walkability: 24 hours from installation
Water vapour resistance factor (UNI EN ISO 10456): μ 8 (DRY FIELD)
Reaction to fire: Euroclass A1fl (non-combustible)
CE marked according to UNI EN 13813 and Anab-Icea certified for green building.
Supplied in bags, mixed with water according to the manufacturer's instructions, stretched, beaten, flattened and smoothed.

The costs for cleaning and preparation of the base, beating, piling, vibrating, mechanical or hand compaction, etc., are included and compensated; the charges for the formation of slopes connected to the collection points as per the project drawing, the charges for the establishment of the openings for the passage of the plants; the insulation joints made of 1cm thick compressible material along the perimeter of the rooms and around the pillars, the creation of joints in correspondence with any existing ones, the level pulling, the fine trowel of the surface suitable for receiving the installation of the ceramic finish; compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

17.5.4. Primate Phonomax type anti-impact acoustic mat 10mm thick

Supply and installation of a hinged mat suitable for impact sound insulation type Primate Phonomax or similar to be sampled and submitted to the approval of the D.L., thickness 10mm, in chemically cross-linked closed-cell polyethylene foam chemically coupled with Phonotek heat-bonded polyester fiber with high grammage, laid after decoupling the perimeter walls of the screed by laying an adhesive perimeter band type Primate Phonoper in cell-shaped polyethylene foam closed, with a special "milled" for an easy "L" laying, 5mm thick, avoiding the vertical flap of the mat which will have the following main technical characteristics:

- Reaction to fire class UNI EN 13501-1: class E
- Dynamic stiffness s': 11-19 MN/m3 (UNI EN 29052-1)
- Impact noise reduction ΔLw dB 36 (UNI EN ISO 12354-2 UNI TR 11175)
- Compressive strength, UNI EN 826: 13 kPa
- Density: 30 kg/mc (UNI EN 1602)

The sheets must be carefully approached using the rebate and joined with Primate Phonojoin type joint tape, a low-thickness adhesive tape for taping the joints and overlaps of the acoustic mats. Made of chemically cross-linked closed-cell polyethylene foam, coupled on the upper face with embossed aluminized PET film and on the lower face with anti-stretching adhesive screening. Thickness 1.8mm; height 5cm.

The preparation and cleaning of the bottom, cutting, scraping, supply and installation of the perimeter strip in order to avoid the formation of acoustic bridges, the sealing of all joints, compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner are included and compensated.

17.5.5. Sand and cement reinforced screed, about 6cm thick

Supply and installation of reinforced screed, in sand and cement, about 6cm thick, made of cement conglomerate, machine-packed, dosed at least 300Kg of R325 type cement per cubic meter of aggregate with regulatory grain size with a strength greater than Rck = 20 N/mm2.
Mechanically executed and pumped on site, reinforced with electro-welded mesh consisting of FeB44k steel rods with a diameter of 6mm with a 10x10cm mesh.
Well compacted and leveled.

The costs for cleaning and preparation of the base, beating, piling, vibrating, mechanical or hand compaction, etc., are included and compensated; the charges for the formation of the slopes connected to the collection points as per the project drawing, the charges for the formation of the recess for the installation of the recessed doormat; the insulation joints made of compressible material 1cm thick along the perimeter of the rooms and around the pillars, the construction of joints in correspondence with any existing ones, the level run; the fine trowel of the surface, compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

17.5.6. Waterproofing layer before laying the stoneware

See chapter Waterproofing.

17.5.7. Concrete-effect stoneware tile finish

Finish in concrete-effect stoneware tiles, see chapter Floor and Wall Tiles.

17.6. FL07 - Stratigraphy of the Kitchen Area – FIRST FLOOR

Laid on stratigraphy by the Structures Project, final thickness about 20cm, having the following stratigraphy:

17.6.1. XPS insulating panel 5cm thick

Supply and installation of XPS insulating panels, single-layer extruded expanded polystyrene panels consisting of perfectly closed, uniform and homogeneous cells filled with gases with reduced environmental impact according to the latest international standards, with radon gas protection.
For thermal insulation, high mechanical resistance to compression, ease of cutting and installation.
The product should be stored indoors, in well-ventilated rooms and away from heat and ignition sources.

Specifications:
Declared thermal conductivity EN 12667: λD 0.036 W/(m·K)

Fire reaction class EN 13501-1: E
Resistance to water vapour diffusion μ = 80/100 (EN 12086)
Compressive strength with 10% strain EN 826: 200 kPa
Declared thermal resistance Rd 2.75mqK/W
Density: 30kg/mc
Installed following the instructions of the supplier.

Cutting and scrap are included and compensated, including all ancillary processes to give the product completely sealed and glued to the underlying structure, the costs for cleaning and preparation of the substrate, cleaning for the end of the work, compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

17.6.2. Separation layer made of polyethylene sheets

Supply and installation of a separation layer, made of LDPE low-density polyethylene, transparent in colour, with a nominal thickness of 0.10 mm and cold micro-perforation of the surface that makes it permeable to vapour, free from glues or resins.
Dry laid overlapping on the joints of at least 10 cm.
The sheet must have the technical characteristics duly certified and accepted by the D.L.

- Areic mass EN 1849-2 (kg/m2) 0.10 (±10%)
- Average nominal thickness EN 1849-2 (mm) 0.10 (±15%)
- Vapor diffusion resistance EN 1931 (μ) ≤10000
- Resistance to vapour diffusion Value Sd (m) (μ x d) 10000 x 0.0001 = 1
- Elongation at breaking point ISO 527-3 (%) ≥250%
- ISO 527-3 Tensile Strength (MPa) ≥17

The price includes and compensates for the costs for cutting, scrap, flaps, compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

17.6.3. Lightened screed, approx. 6 cm thick

Supply and installation of lightened screed hanging where necessary, variable thickness according to stratigraphy, consisting of premixed based on expanded clay and specific binders and additives, with controlled shrinkage.
Mechanically executed and pumped on site.
Well compacted and levelled data on site, having the following technical characteristics:
Density approx. 1,000 kg/m3,
Average certified compressive strength 12 N/mm2,
Certified thermal conductivity λ 0.251 W/mK,
Walkability: 24 hours from installation
Water vapour resistance factor (UNI EN ISO 10456): μ 8 (DRY FIELD)
Reaction to fire: Euroclass A1fl (non-combustible)

CE marked according to UNI EN 13813 and Anab-Icea certified for green building.
Supplied in bags, mixed with water according to the manufacturer's instructions, stretched, beaten, flattened and smoothed.

The costs for cleaning and preparation of the base, beating, piling, vibrating, mechanical or hand compaction, etc., are included and compensated; the charges for the formation of slopes connected to the collection points as per the project drawing, the charges for the establishment of the openings for the passage of the plants; the insulation joints made of 1cm thick compressible material along the perimeter of the rooms and around the pillars, the creation of joints in correspondence with any existing ones, the level pulling, the fine trowel of the surface suitable for receiving the installation of the ceramic finish; compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

17.6.4. Primate Phonomax type anti-impact acoustic mat 10mm thick

Supply and installation of a hinged mat suitable for impact sound insulation type Primate Phonomax or similar to be sampled and submitted to the approval of the D.L., thickness 10mm, in chemically cross-linked closed-cell polyethylene foam chemically coupled with Phonotek heat-bonded polyester fiber with high grammage, laid after decoupling the perimeter walls of the screed by laying an adhesive perimeter band type Primate Phonoper in cell-shaped polyethylene foam closed, with a special "milled" for an easy "L" laying, 5mm thick, avoiding the vertical flap of the mat which will have the following main technical characteristics:

- Reaction to fire class UNI EN 13501-1: class E
- Dynamic stiffness s': 11-19 MN/m3 (UNI EN 29052-1)
- Impact noise reduction ΔLw dB 36 (UNI EN ISO 12354-2 UNI TR 11175)
- Compressive strength, UNI EN 826: 13 kPa
- Density: 30 kg/mc (UNI EN 1602)

The sheets must be carefully approached using the rebate and joined with Primate Phonojoin type joint tape, a low-thickness adhesive tape for taping the joints and overlaps of the acoustic mats. Made of chemically cross-linked closed-cell polyethylene foam, coupled on the upper face with embossed aluminized PET film and on the lower face with anti-stretching adhesive screening. Thickness 1.8mm; height 5cm.
The preparation and cleaning of the bottom, cutting, scraping, supply and installation of the perimeter strip in order to avoid the formation of acoustic bridges, the sealing of all joints, compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner are included and compensated.

17.6.5. Sand and cement reinforced screed, about 6cm thick

Supply and installation of reinforced screed, in sand and cement, about 6cm thick, made of cement conglomerate, machine-packed, dosed at least 300Kg of R325 type cement per cubic meter of aggregate with regulatory grain size with a strength greater than Rck = 20 N/mm2.

Mechanically executed and pumped on site, reinforced with electro-welded mesh consisting of FeB44k steel rods with a diameter of 6mm with a 10x10cm mesh.
Well compacted and leveled.

The costs for cleaning and preparation of the base, beating, piling, vibrating, mechanical or hand compaction, etc., are included and compensated; the charges for the formation of the slopes connected to the collection points as per the project drawing, the charges for the formation of the recess for the installation of the recessed doormat; the insulation joints made of compressible material 1cm thick along the perimeter of the rooms and around the pillars, the construction of joints in correspondence with any existing ones, the level run; the fine trowel of the surface, compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

17.6.6. Waterproofing layer before laying the stoneware

See chapter Waterproofing.

17.6.7. Stone-effect stoneware tile finish

Stone-effect stoneware tile finish, see chapter Floor and Wall Tiles.

17.7. FL08 - Stratigraphy for DH corridors, MEP tunnel and elevator landing – FIRST FLOOR

Laid on stratigraphy by the Structures Project, final thickness about 20cm, having the following stratigraphy:

17.7.1. XPS insulating panel 5cm thick

Supply and installation of XPS insulating panels, single-layer extruded expanded polystyrene panels consisting of perfectly closed, uniform and homogeneous cells filled with gases with reduced environmental impact according to the latest international standards, with radon gas protection.
For thermal insulation, high mechanical resistance to compression, ease of cutting and installation.
The product should be stored indoors, in well-ventilated rooms and away from heat and ignition sources.

Specifications:
Declared thermal conductivity EN 12667: λD 0.036 W/(m·K)
Fire reaction class EN 13501-1: E
Resistance to water vapour diffusion μ = 80/100 (EN 12086)
Compressive strength with 10% strain EN 826: 200 kPa
Declared thermal resistance Rd 2.75mqK/W
Density: 30kg/mc
Installed following the instructions of the supplier.

Cutting and scrap are included and compensated, including all ancillary processes to give the product completely sealed and glued to the underlying structure, the costs for cleaning and preparation of

the substrate, cleaning for the end of the work, compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

17.7.2. High-density polyethylene foil vapour barrier

Supply and installation of a vapour barrier for protection against rising humidity, made of high-density polyethylene HDPE, impermeable to water vapour, having the following main technical characteristics:

- Nominal thickness: 200 µm
- Water vapour resistance - SD (WVTV): Sd = > 75 m

Laid dry by surmounting the sheets for 10 cm, fixing the joints of the overlaps using high-strength aluminized tape, with a thickness of 5cm H and 1mm, specific for sealing the sheets together ensuring the continuity of the vapour barrier.
The price includes and compensates the costs for cutting, scrap, overlapping, the tape for joining the overlaps, compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

17.7.3. Reinforced concrete industrial flooring

See Structures project.

17.7.4. Finish type HF02

See chapter Floor and Wall Coverings.

17.8. FL10 – Stratigraphy for waste room

Execution of the following works for new local waste stratigraphy:

17.8.1. Waterproofing layer before laying the stoneware

See chapter Waterproofing.

17.8.2. Porcelain stoneware flooring

See chapter Floor and Wall Coverings.

17.9. FL14 – Stratigraphy for internal flooring of corridors, technical rooms and warehouses, ground floor office block

Stratigraphy for interior flooring, about 50cm thick, composed as follows:

17.9.1. Stabilized granular mix

See Structural Project.

17.9.2. Insulating panel type Foamglass Floor Board T4, th. 100mm

Supply and installation of an insulating panel such as Foamglass Floor Board T4 or similar to be submitted to the approval of the D.L., 100mm thick, consisting of glued Foamglas T4+ sheets, produced from highly selected recycled glass and raw materials particularly abundant in nature; Completely inorganic, it contains no propellants, flame retardant additives or binders.
The upper part is covered with a layer of green fiberglass reinforcement and the lower part with a white veil.
Waterproof, resistant to pests, compression, acids, non-combustible, vapour-resistant, stable in shape, environmentally friendly, with radone gas protection, easy to process, with the following technical characteristics according to EN 13167:

- Apparent specific gravity (± 10%) (EN 1602): 115 kg/m3
- Thermal conductivity (EN ISO 10456): λD ≤ 0.041 W/(m·K)
- Fire behaviour (EN 13501-1): Euroclass E (cellular glass in accordance with Euroclass A1)
- Point load (EN 12430): PL ≤ 1.5 mm
- Compressive strength (EN 826 Annex A): CS ≥ 600 kPa
- Modulus of rupture and breaking strength (EN 12089): BS ≥ 450 kPa
- Tensile strength (EN 1607): TR ≥ 150 kPa
- Resistance to vapour diffusion μ = ∞ (EN ISO 10456)

Laid and sealed with hot bitumen or cold adhesive at the choice of the D.L. and following the instructions of the supplier.

Cutting and scrap are included and compensated, including all ancillary processes to give the product completely sealed and glued to the underlying structure, the costs for cleaning and preparation of the substrate, cleaning for the end of the work, compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

17.9.3. Separation layer made of polyethylene sheets

Supply and installation of a separation layer, made of LDPE low-density polyethylene, transparent in colour, with a nominal thickness of 0.10 mm and cold micro-perforation of the surface that makes it permeable to vapour, free from glues or resins.
Dry laid overlapping on the joints of at least 10 cm.
The sheet must have the technical characteristics duly certified and accepted by the D.L.

- Areic mass EN 1849-2 (kg/m2) 0.10 (±10%)
- Average nominal thickness EN 1849-2 (mm) 0.10 (±15%)
- Vapor diffusion resistance EN 1931 (μ) ≤10000
- Resistance to vapour diffusion Value Sd (m) (μ x d) 10000 x 0.0001 = 1
- Elongation at breaking point ISO 527-3 (%) ≥250%
- ISO 527-3 Tensile Strength (MPa) ≥17

The price includes and compensates for the costs for cutting, scrap, flaps, compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by

Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

17.9.4. Industrial flooring

See Structures project.

17.9.5. Finish type HF02

See chapter Floor and Wall Coverings.

18. FLOOR AND WALL TILES

18.1. Generality

General requirements

It is expressly forbidden to place boards for the passage of workers and materials on freshly cast or laid floors; the Contractor will be required to provide efficient barriers to prohibit this passage for as long as necessary to stabilize the floor; As a rule, the following parameters will be adopted:
No less than 10 days for floors laid on mortar;
No less than 72 hours for floors installed with gluing with adhesives.
However, it is established that, if the floors are damaged in whole or in part due to the illegal passage of people or for other causes, the Contractor must remove and subsequently rebuild the damaged parts at his own expense and expense.
The surface intended for the installation of floors of any type must be suitably levelled by means of a substrate, so that the surface to be laid is regular and parallel to that of the floor to be laid and to the necessary depth, taking into account the thickness of the elements to be used and the height of the finished floor.
The substrate may consist, according to the requirements of the Works Management, of a screed of hydraulic or cementitious concrete (dosed with not less than 300 kg of cement/m3, unless otherwise prescribed) normal or lightened (with light aggregates or cellular), with a thickness in any case not less than 3 cm, which must be cast on site in due time to be left to mature for at least 10 days.
In any case, the formation of lesions must be avoided by resorting, if appropriate, to the use of anti-shrinkage additives or, in the case of considerable extensions, by creating suitable joints.
The depth of the cuts must be greater than 1/6 of the total thickness of the flooring. Before laying the floor, however, the lesions that appear in the substrate will be filled and grouted with a drink of hydraulic lime or cement, as the case may be.

Floors

The installation of floors of any type must take place so that their surface is perfectly flat, the individual elements must be well fixed to the substrate and perfectly matched, even if this may require special trimming, as in the case of floors made on inclined substrates.
The execution of the floors, in the face of exceptionally high daytime temperatures, must be limited to the coolest hours of the morning or evening; it must instead be suspended if the rigidity of the temperature could give rise to frost.
All floors must be delivered perfectly clean, without stains of any kind and without breakage. It is contractually established that, for a period of at least ten days after the completion of each floor, the Contractor is obliged to prevent access to the premises by anyone by means of temporary closures and/or barriers. If this is not possible, the Contractor must protect the floors with suitable plank laid on the places of transit, or other suitable system, remaining at the expense of any compensation and reconstruction.
It should be noted that any trapdoors covering manholes placed inside paved rooms must be finished with the same flooring material.

Fine porcelain stoneware flooring

Fine porcelain stoneware floors will be made with tiles, special pieces (skirting boards, fittings, corners, edges, thickened steps, triangles, strips, tozzetti, etc.) of fine stoneware, with a homogeneous solid section and full-thickness vitrified.
The thickness of the elements and in particular of the tiles, defined in the approved projects according to the size of the individual tile and the operating load and characteristics of use of the room in which this flooring is to be used.
The mixture will be obtained from a very fine mixture of fine clays, national and foreign, with the addition of feldspars and kaolins. The product will be obtained by pressing atomized dough with a specific weight of 450 Kg/mc, at a firing temperature of 1,250°C.
The minimum performance characteristics of the tiles will be as follows:
percentage of water absorption <= 0.05%;
resistance to temperature changes;
colour fastness to light and ultraviolet rays;
flexural strength >= 50 N/sq mm;
hardness Mohs scale >= 8;
linear thermal expansion 6.5 x K-1; resistance to acids and bases;
frost resistance – antifreeze;
resistance to deep abrasion – loss of volume <= 130 sq mm;
non-flammable;
breaking load >= 510 Kg;
impact resistance 0.20 Kgm.
For pavements in areas subject to heavy traffic, the requirements set out in Part I section H1 point 1.4 must be complied with.
The formats will be of the commercial type with a raw finish (natural), sanded by the factory, structured or non-slip, according to the indications of the project or the Works Management.
The sealing of the joints, to be carried out with epoxy grout, must be carried out carefully, filling the joints individually and limiting the contact of the product with the surfaces of the tiles.
After installation, the entire surface must be cleaned with acid-based detergents. The cleaned floor must be carefully protected in case of further work after its installation.
Before using the floor, it should be washed with mild soap and rinsed with water, followed by vacuuming.

Toilet floor and wall tiles
Whatever the material to be used for floors and walls, it must have absolute regularity of shape, absence of surface defects, uniformity and stability of colors, and resistance adequate to the conditions of use.
For materials whose use also includes flooring, please refer to the specific legislation reported in the previous article.
Glazed ceramic tiles: made up of clays and/or kaolin, sand, fluxes and other mineral materials, with processes including at least one firing over 900°C characterized by a porous support covered with a transparent or opaque vitreous layer and possibly colored and/or decorated, they must comply with UNI requirements.
After an appropriate surface treatment, it is advisable to apply the coating with bonding products, preferably not cement-based.
Special provisions in bathrooms

A suitable coating against water projections must be applied to the surface of the wall near the sanitary appliances.
General flatness
By applying a 200 cm long ruler to the surface of the finished construction and moving it in all directions, the difference between the most protruding and the most recessed point must not exceed 5 mm.
Local flatness
By applying a 20 cm long ruler to the wall surface at the joints, the difference between the differences in height must not be greater than 1 mm.
Verticality
The verticality tolerance, measured over a height of 250 cm, must not exceed 5 mm.

Plinths, skirting boards and coverings
Elements of any type or size must be placed in such a way as to confer exactly between them and adhere perfectly to the structures behind.
Porous materials, before their use, must be immersed in water until saturated. When the work is completed, the joints must be perfectly aligned, plumb and level; the connections must be grouted in accordance with the indications of the D.L.
The price always includes the scratch coat to be carried out on the masonry or underlying structures before laying the coating and all the charges for the correct installation, even if this must be carried out with discontinuity in relation to the installation of ducts, systems, etc.
It also includes the cost of installing accessories supplied by the D.L., both recessed and applied by means of caps or dowels.
Where required, and provided for in the description of the individual prices, edges, fittings, terminals, etc., must be formed by means of special pieces or by cutting the elements at any angle.

Joints
In correspondence with the structural joints, profiles for expansion joints in aluminium with perforated anchoring fins must be laid on the floor, and equipped with an elastic neoprene gasket. Where the floor has characteristics of compartmentalization against fire, fire joints such as JOINT BAF or similar will also be inserted to guarantee the required REI value.
At the joints between floors of different types, straps fixed to dowels and/or silicone must be laid.
In all floors, PVC profiles must be laid for "filler" type expansion joints, penetrating the bedding, resistant to wear, temperature (from -30°C to +120°C), oils, acids, solvents and bituminous substances in general.
Fractionation joints of 3 mm in width must be made in floors larger than 25 square meters.
The corridors must have a joint at least every 8.00 ml.
Peripheral joints of at least 3 mm in width must be provided in correspondence with all walls, pillars, steps, etc.
The sealing of the joints must be obtained with an elastic silicone sealant, of the same colour as the grout of the joints (the edges to be sealed must be perfectly clean, dry and primed).
Installation must not be carried out at a temperature below +5°C or above +30°C.
No earlier than 12 hours nor after 24 hours from the installation of the coatings, the joints must be sealed.
The joints to be filled must be cleaned throughout the thickness of the coating.

Before sealing, the joints to be filled must be thoroughly cleaned.
To clean, the surface of the coating will have to be wiped with a slightly moistened Scotch Brite sponge, removing excess sealant.
When the sealant is well hardened, it will have to be wiped with a dry and clean cloth to remove the remaining traces.
On hot or windy days, the good hydration of the sealant must be ensured by keeping the joints moist with clean water, when they have begun to harden.
The verticality of the walls must be such that the "out of plumb" over a height of 3 meters is not more than 1 cm.

Tiles in general

The tiles, in addition to corresponding to the characteristics mentioned by the UNI standards in force, may be subjected, at the discretion of the D.L., to tests of hardness, resistance, wear due to sliding friction, water absorption, penetration of colouring solutions, resistance to compression, resistance to bending, impact breakage, resistance to chemical attack, resistance to abrasion, frost resistance, according to the procedures established by the Unification Regulations in force.
- Fine ceramic stoneware tiles (porcelain)
The shape, size, colours and tones of fine ceramic tiles (porcelain) are those established in the price list and/or indicated by the D.L., for choice of samples.
The dimensions and classifications of qualitative choice, as well as the shape, calibers, dimensional and shape tolerances of fine ceramic tiles (porcelain) and packaging must correspond to the Unification Standard:
- Concrete blocks and washed concrete tiles
For the verification of the appearance and geometric characteristics, reference will be made to the Unification Rules:
- UNI EN 1338:2004 Concrete paving blocks – Requirements and test methods

Adhesives for flooring and cladding

The adhesives to be used for the installation of floors, cladding, etc., must be chosen by the Contractor taking into account the nature and quality of the substrates and the products to be glued; the Contractor must also achieve the results prescribed by these Specifications with the stickers.
The containers of the stickers must be stored well sealed and at a temperature of 15-20°C, for a period that does not exceed 12 months from the date of their packaging. Therefore, all the containers of stickers deposited on the construction site must clearly show the date of manufacture of their contents, since adhesive products that have exceeded 12 months from that date will be rejected by the D.L.
All adhesives, once applied, must be insoluble in water.
If the adhesive product is prepared with two components, the Contractor must package the mixture in strict compliance with the manufacturer's requirements.
The adhesives must be spread on one or both sides of the adhesion of the substrates and the products to be glued, according to the provisions of the manufacturer.
The surfaces to be glued, whatever their nature, must be healthy, not subject to crumbling and perfectly dry; before gluing, they must be free from all traces of dust, oils, grease, rust, paint, alkaline salts, etc.; in particular, mortars and conglomerates must have abundantly completed their setting.

If the manufacturer prescribes it, the Contractor, before proceeding with the gluing operations, must apply fixers (primers) or special adhesives on the appropriate surfaces.
The stickers must be compatible with the materials on which they will be applied.

- Polychloroprene adhesives
Use: gluing plastic laminates, etc.
Characteristics: aqueous or solvent solutions, they will have excellent properties of resistance to ultraviolet rays, aging, atmospheric agents and temperature.
- Adhesives based on styrene-butadiene rubber
Use: bonding ceramic tiles, PVC, rubber-metal, etc.
Characteristics: latex-type solutions and from rubbers polymerized at 50 degrees C.
- Natural rubber-based adhesives
Use: gluing of floors, felt, paper, etc.
Characteristics: solutions of natural rubber or synthetic polysoprene in organic solvents or natural rubber lactic acids.
- Epoxy-polyamine adhesives
Use: bonding of metals, wood, ceramics, etc
Characteristics: liquid, solid, paste, powder resins, already mixed with hardening that can be obtained by heat or with substances to be added at the time of application.

18.2. Method of execution

Installation of ceramic coverings
The installation will be carried out in a perfect workmanlike manner and in compliance with the following indications.
The surfaces on which the tiles will be installed will be prepared, well leveled and cleaned so that the installation can be perfectly professional.

The floors will be laid on a level substrate with a thickness of not less than 3 cm, consisting of mortar composed of assorted aggregates with a dosage of at least 350 kg / m.
The construction of this substrate, perfectly leveled, will be the responsibility of the tile installer.
The installation of the coatings will take place on finished surfaces or rustic plaster.
The laying surface must be free of plaster film residues and clean of dust and removable parts.
The adhesive, prepared according to the prescriptions, must be applied with a notched trowel.
The thickness of the adhesive may not be less than 1.5 mm and not more than 3 mm.
The cementitious adhesive will be added with elasticizing latex, especially for installation in humid environments.
The tiles must be beaten or pressed in such a way as to cause the partial crushing of the adhesive for at least 60-70% of the surface on the reverse side of the tile.
The structural expansion joints must be respected by the adhesive and tiles.
The tiles will always be carefully cut by machine. Cutting with a hammer, chisel, pliers, etc. is not permitted. The cut should always be achieved with regular edges.
The tiles will be in close contact around the fruit boxes of the electrical system and accessories, so that the plates are then perfectly overlapped with the tiles.
The tiles will be cleaned during the course of the work in order to minimize the final cleaning.

Cleaning will also be extended to the walls adjacent to the coated surface.
All joints will be the same width, arranged at right angles to each other and parallel to the walls. The width of the joints will be adjusted by shims or other approved system; the joints must be of minimum thickness and perfectly aligned, no minimally imperfect elements must be installed due to breakage at the edges or edges.
Particular care in the symmetrical subdivision of the tiles will be used in the case of pillar coverings and/or pilasters, in the presence of corner protectors or metal joints.
The finished floors must be perfectly level; therefore, during installation, continuous level checks must be carried out.
Where prescribed and in any case for surfaces greater than 25 square meters, suitable expansion joints must be made, both longitudinal and transverse. The joints must be placed perpendicular to the wall of greatest development and in such a way as to create fields of similar surface.
Outdoor floors must be adequately protected from the direct action of sunlight for the time necessary for the normal setting and hardening of the mortar and, if necessary, must be kept slightly wet in the first few days.
They must also be kept protected from both wind and heavy rain and frost.
In the case of tile skirtings, the use of elements of the same type used for the corresponding floor is normally envisaged, unless otherwise indicated.
The requirements for tile coverings apply to installation.
Particular care must be observed in respecting the wires and alignments that coincide exactly, as provided for in the project drawings. The floor joints must coincide perfectly with those of the wall tiles.
The floor shells are sized in such a way as to find the same module, adding them to the thickness of the masonry, of the joints. A form that even in these cases must be absolutely respected.
The tile coverings will be laid on a substrate consisting of rustic plaster troweled in bastard mortar.
All newly paved surfaces must be adequately protected until completely dry.
At each suspension of work, care must be taken to check that the outline of the sections already laid and that remain interrupted is well aligned and that the mortar or adhesive is trimmed along the perimeter of the interruption.

Installation of stone cladding

Stone materials are typically subject to warping and/or expansion, both due to the effect of moisture from the substrate or bedding material, and to thermal gradients. In the presence of water, moreover, some types of stone can stain or give rise to unsightly efflorescence.
The two issues are not closely related to each other and must therefore be assessed independently.
The sensitivity to warping due to the presence of water or thermal variations, typical of some stone materials, has a decisive influence on the choice of the adhesive to be used for installation. The wrong choice of adhesive, in fact, could compromise the functionality of the coated surface
The tendency to warp involves, in particular, some types of green marbles (e.g. Verde Alpi), some types of Slate and Pietra Serena and some recomposed polyester resin (the latter due to thermal variations) and depends strictly on the geometry, size and thickness of the slabs. This instability, therefore, is influenced both by the nature of the stone and by its geometric characteristics, and this makes it practically impossible to predict what its behavior may be during installation or in operation without in-depth tests being carried out on the material beforehand.

The problems of staining and/or formation of efflorescence on the surface of the stone material can occur in the presence of water and can therefore be linked to various factors:

- Installation carried out in traditional on a mortar bed or using a normal setting adhesive;
- Installation carried out on a substrate that is not adequately insulated from rising damp from the ground;
- Installation carried out on a substrate that is not dry, which still has a high percentage of humidity at the time of installation.

The formation of efflorescence can potentially affect all stone materials but, as far as the formation of real stains is concerned, it is particularly important in marble, quartzite, granite and light-colored recompotes (e.g. Carrara marble, Thassos, pink quartzite, etc.).
The problem is attributable to the presence in the stone material itself of substances that can be dissolved by the alkaline water rising from the substrate or from the laying bed (in the case of soluble salts) or react with it (in the case mainly of iron ores).
The use of rapid cementitious adhesives, which reduce the time of contact of the stone with water, preventing it from rising to the surface, or reactive adhesives can prevent these problems from occurring. All this can still be repeated in the event that the substrate has not been correctly prepared.
To be suitable for laying a stone cladding, the supports must meet specific requirements, which vary depending on the intended use.
Some indications referring to the intended use are reported in the respective regulations:

- UNI 11714-1:2018 Stone coatings of horizontal and vertical surfaces and ceilings – Part 1: Instructions for design, installation and maintenance
- UNI 11714-2:2019 Stone coatings of horizontal, vertical surfaces and ceilings – Part 2: Knowledge, skills and competence requirements for installers of stone coatings of horizontal, vertical surfaces and ceilings

Some of the most relevant characteristics of the substrate to be evaluated prior to installation are:

- The thickness: the determination of the suitable thickness depends on the type of support.
- For materials sensitive to water, both from the point of view of deformation and staining, it is always advisable to check that the substrate is free from problems of rising humidity.

In the case of screeds, therefore, it will be necessary to make sure of the presence of a suitable vapour barrier or, in the case of a new construction, to create a screed of at least 4 cm thick isolated from the substrate by interposing a polyethylene sheet that prevents water from rising.

- Mechanical strength and compactness: mechanical strength must be evaluated according to the operating conditions of the coating and its intended use.

Indicatively, a resistance of 20 MPa is considered adequate for a substrate in a residential environment, which must be increased to 30 MPa in the case of a commercial/industrial environment. For a plaster on the façade, on the other hand, the strength should be evaluated on the basis of tear tests and be at least equal to 1 MPa.

Seasoning

Before proceeding with installation, the substrate must be adequately seasoned.

The curing time for cementitious substrates is to be considered about 7-10 days per centimeter of thickness.
During this time, screeds and plasters are subject to hygrometric shrinkage that can lead to the formation of cracks; Installation carried out without respecting the correct timing, therefore, can lead to the risk of transferring these cracks to the cladding with consequent possible detachments. The time can be appropriately reduced by using binders or premixed mortars with fast or rapid drying
The curing of traditional cementitious screeds or cementitious plasters can be quantified in 7-10 days per centimeter of thickness.
The installation of flooring and cladding by means of adhesive that must be kneaded and applied to the substrate using a trowel whose teeth must be chosen according to the size of the covering to be laid. The choice must be made in such a way as to ensure good wetting of the back of the slabs.
The sheets must be applied to the fresh adhesive within its open time, checking that no surface skin has formed; In this case, a new layer of fresh adhesive must be applied, exerting good pressure on the sheets to ensure the transfer of the adhesive and make the necessary adjustments before the product enters the grip.
The installation must be carried out respecting a minimum joint and creating splitting joints every about 20-25 m². Once the adhesive has hardened, it is possible to grout the coating with a specific mortar and seal the joints using a suitable elastic sealant.
The choice of the adhesive suitable for laying stable stone material (Mapei class A type) must be non-sensitive to staining, and depending on the type of substrate

Precautions and protections
In exasperated weather conditions, the interior floors will then have to be repaired by closing the openings, if they do not have fixtures, with plastic sheets.
In the case of outdoor floors, it will be forbidden to proceed with installation when the temperature extends beyond the range between -5°C and +35°C.
Once the floors have been laid, they must be protected from wind, sunlight and rain.
No less than 30 days must elapse before subjecting the floors to weights, or in any case to loads and operating stresses.

18.3. Reference legislation

General rules for raised floors

- UNI EN 12825:2003 Raised floors
- UNI 11617:2016 Removable indoor modular raised floors – Design, installation and maintenance instructions
- UNI EN ISO 10848-2:2017 Laboratory measurement of lateral transmission of airborne noise and footfall noise between adjacent environments – Part 2: Test on type B elements in the case of low-influence joints
- UNI EN 13501-1:2019 Fire classification of building products and elements - Part 1: Classification based on the results of reaction to fire tests

General rules on ceramic tiles

- UNI EN ISO 10545-1:2014 Ceramic tiles - Part 1: sampling and acceptance criteria
- UNI EN ISO 10545-2:2018 Ceramic tiles - Part 2: determination of dimensional characteristics and surface quality
- UNI EN ISO 10545-3:2018 Ceramic tiles - Part 3: Determination of water absorption, apparent porosity, apparent relative density and apparent density
- UNI EN ISO 10545-4:2019 Ceramic tiles - Part 4: Determination of modulus of rupture and breaking force
- UNI EN ISO 10545-5:2000 Ceramic tiles - determination of impact resistance by measurement of the coefficient of restitution
- UNI EN ISO 10545-6:2012 Ceramic Tiles - Part 6: Determination of Deep Abrasion Resistance for Unglazed Tiles
- UNI EN ISO 10545-7:2000 Ceramic tiles - Determination of surface abrasion resistance for glazed tiles
- UNI EN ISO 10545-8:2014 Ceramic tiles - Part 8: determination of linear thermal expansion
- UNI EN ISO 10545-9:2014 Ceramic tiles - Part 9: determination of resistance to thermal changes
- UNI EN ISO 10545-10:2021 Ceramic tiles - Part 10: determination of expansion due to moisture
- UNI EN ISO 10545-11:1996 Ceramic tiles – Part 11: determination of the resistance to cavities for glazed tiles
- UNI EN ISO 10545-12:2000 Ceramic tiles. Determination of frost resistance
- UNI EN ISO 10545-13:2017 Ceramic tiles – Part 13: determination of chemical resistance
- UNI EN ISO 10545-14:2015 Ceramic tiles – Part 14: determination of stain resistance
- UNI EN ISO 10545-15:2021 Ceramic tiles - Part 15: determination of lead and cadmium released by tiles
- UNI EN ISO 10545-16:2012 Ceramic tiles - Part 16: determination of small differences in colour
- DIN 51094 Ceramic tiles – Testing of the light fastness and colour fastness of ceramic tiles for walls and floors
- DIN 51130 Ceramic tiles. Determination of slipperiness. Average coefficient of friction (μ).

<u>Product requirements of ceramic tiles</u>

- UNI EN 121 Ceramic tiles. Extruded tiles with low water absorption (E<3%). Group Al
- UNI EN 186 Ceramic tiles. Extruded tiles with water absorption (3%<E<6%). Group Alla
- UNI EN 187 Ceramic tiles. Extruded tiles with water absorption (6%<E<10%). Gruppo Allb.
- UNI EN 188 Ceramic tiles. Extruded tiles with water absorption (E>10%). Alll Group
- UNI EN 176 Dry-pressed ceramic tiles with low water absorption (E<3%). Group Bl

- UNI EN 177 Dry-pressed ceramic tiles with water absorption (3%<E<6%). Blla Group
- UNI EN 178 Dry-pressed ceramic tiles with water absorption (6%<E<10%). Bllb Group
- UNI EN 159 Dry-pressed ceramic tiles with water absorption (E>10%). Blll Group

Test Methods on Ceramic Tile Adhesives

- UNI EN 13888-2:2022 Sealants for ceramic tiles – Part 2: Test methods
- UNI EN 12004-1:2017 Adhesives for ceramic tiles – Part 1: Requirements, evaluation and verification of constancy of performance, classification and marking
- UNI EN 12004-2:2017 Adhesives for ceramic tiles – Part 2: Test methods

General PVC flooring

- UNI EN 13501-1:2019 Fire classification of building products and elements - Part 1: Classification based on the results of reaction to fire tests
- UNI EN 13893:2005 Resilient, laminate and textile floor coverings - Measurement of the dynamic coefficient of friction on dry floor surfaces
- UNI EN ISO 10140-3:2021 Acoustics - Laboratory measurement of sound insulation of buildings and building elements – Part 3: Measurement of impact sound insulation
- UNI EN ISO 10581:2020 Resilient floor coverings - Homogeneous floor coverings based on polyvinyl chloride - Specification
- Construction products – Assessment of the release of hazardous substances – Determination of emissions into the indoor environment
- UNI EN 1815:2016 Resilient and textile floor coverings - Assessment of the propensity to accumulate static electricity
- UNI EN 12667:2002 Thermal performance of building materials and products - Determination of thermal resistance by the hot plate method with guard ring and by the thermoflowmeter method - Products with high and medium thermal resistance
- UNI EN ISO 10456:2008 Building materials and products - Hygrometric properties - Tabulated design values and procedures for the determination of declared and design thermal values

General standards for textile flooring

- UNI EN 1307:2019 Textile floor coverings - Classification
- UNI EN ISO 10833:2019 Textile coatings for flooring – Determination of the resistance to damage of cut edges, by means of the modified Vettermann drum test
- UNI EN ISO 105-B02:2014 Textiles - Colour fastness tests – Part B02: Colour fastness to artificial light: Xenon arc lamp test

- UNI EN ISO 105-X12:2016 Textiles - Colour fastness tests – Part X12: Colour fastness to rubbing
- UNI EN ISO 105-G01:2016 Textiles - Colour fastness tests – Part G01: Colour fastness to nitrogen oxides
- UNI EN ISO 105-D02:2016 Textiles - Colour fastness tests – Part D02: Colour fastness to rubbing: Organic solvents
- UNI EN ISO 105-X16:2016 Textiles - Color fastness tests – Part X16: Color fastness to rubbing – Small areas
- UNI EN ISO 12951:2020 Textile Floor Coverings – Determination of Mass Loss, Fiber Binding and Change in Appearance of Stair Tretrad Trestep Protection Edges Using Lisson Tretrad's Machine
- ISO 1763:2020 Textile floor coverings – Determination of number of tufts and/or loops per unit lenght and per unit area
- ISO 2551:2020 Textile floor coverings and textile floor coverings in tile form – Determination of dimensional changes due to the effects of varied water and heat conditions and distortion out of plane
- ISO 8543:2020 Textile floor coverings – Methods for determination of mass
- UNI EN ISO 13934-1:2013 Textiles – Properties of Tensile Fabrics – Part 1: Determination of Maximum Force and Elongation at Maximum Force by the Strip Method
- UNI EN ISO 13934-2:2014 Textiles – Properties of tensile fabrics – Part 2: Determination of maximum force by the grab method
- UNI EN ISO 11925-2:2020 Reaction to fire tests – Ignition of products subjected to direct flame attack – Part 2: Test with the use of a single flame
- UNI EN ISO 23999:2021 Resilient floor coverings – Determination of dimensional stability and curling after exposure to heat
- UNI EN 1815:2016 Resilient and textile floor coverings - Assessment of the propensity to accumulate static electricity
- ISO 10965:2011 Textile floor coverings - Determination of electrical resistance
- UNI EN 13501-1:2019 Fire classification of building products and elements - Part 1: Classification based on the results of reaction to fire tests
- UNI EN ISO 10581:2020 Resilient floor coverings - Homogeneous floor coverings based on polyvinyl chloride – Specification
- UNI EN 13893:2005 Resilient, laminate and textile floor coverings - Measurement of the dynamic coefficient of friction on dry floor surfaces

18.4. Acceptance Requirements

For each batch of materials that it will use in the preparation of the products, the Contractor must provide the Works Management with the relevant certificate of origin valid for one year from the date of issue or from the test certificates issued by official laboratories, in particular for tests relating to dimensional and physical-mechanical characteristics.
The supply must be accompanied by the production mark found on the elements or on the appropriate labeling placed on the packaging.

18.5. Performance Specifications

All the services listed in the contractual documents to give the completed works as specified in this specification, in particular the following.
Before the start of the installation of the materials, it will be the responsibility of the Contractor to verify that the environmental conditions of the construction site, with regard to internal humidity, the presence of water or dust, do not represent a risk of degradation of the material and finishes.
This inspection must be carried out promptly so that any necessary restoration work can be carried out in time to comply with the work schedule.
Supply of materials, unless otherwise decided at the time of ordering.
Transport, unloading, storage, protection and custody of materials in environments prepared by the Contractor.
Various transport equipment from the warehouse to the place of use.
Equipment, specialized and ordinary labor for the installation of materials.
Rooms suitable for: shelter, changing room, refectory, etc. for the Contractor's staff, as required by current health and safety regulations in the workplace.
Power and water lines from existing on-site gripping points to user tools.
Substrate and bedding mortar, binders and dyes.
Pre-packaged cementitious adhesives and adhesives for the installation of floors and vertical walls, as an alternative to what is provided for in the following points.
Pre-packaged non-cementitious adhesives and adhesives as an alternative to what is provided for in the next point.
Special cement (not acid-proof) for sealing joints.
Special mortars for sealing joints, pre-packaged and coloured in the paste as an alternative to what is provided for in the next point.
Plaster patches and fittings along the demarcation lines of the coating and the plaster itself.
Special pieces for edges and fittings.
Plastic spacers for aligning the joints.
Special profiles for the production of joints.
Cleaning and all the necessary protections to avoid any and all damage to the finished works.
The restoration of any works damaged during the installation of materials.
The transport from the places of installation and the stacking within the construction site, in a fenced area, previously indicated by the Works Management, of the waste and waste materials. The transport of the same to the disposal sites, including all related charges and practices.
The cleaning of the areas used for the stacking of materials and waste.
Stocks
For each type of flooring, covering and grouting material used, the Contractor must deliver to the Client a quantity of material to be kept in stock to be used as spare parts equal to 2% of the material

laid, but in any case not less than 25 square meters per type. These batches of material must be perfectly identical to those installed.

18.6. Sampling/testing methods

At the request of the Management, the Contractor, at his own care and expense, must deliver to the Management a sample of the floors before the start of the works, which allows the quality of the materials to be ascertained.
A special report of the delivery will be drawn up, signed by the Works Manager and the Contractor, in which the elements constituting the sampling must be described with an indication of the corresponding tariff items, which will compensate for the works and supplies carried out with materials equal to the sample ones.
The samples will be kept in the offices of the Management.
The Management has the right to have all the tests carried out on the samples, at the expense of the Contractor, as it deems appropriate to ascertain the quality of the materials, as well as tests during the works, on the materials put and to be installed, to ascertain their conformity with the samples.

Relating to individual components
The Contractor shall submit for approval a double series of samples of the individual materials it intends to use, including any special pieces, adhesives and fillers, and of finished flooring and cladding, laid on boards of homogeneous stabilised material of medium density (MDF).
The samples must be accompanied by the original packaging of the Manufacturer from which, for the tiles, the following characteristic data can be taken:
CHOICE
CALIBRE
COLOR TONES
These samples must be approved by the Works Management and countersigned by the parties: one series will be kept by the Contractor and one series by the Client
For materials supplied on several occasions, samples will be taken from the individual batches and compared with the initial samples to verify their acceptability.
Without the written approval of the sample by the Works Management, the installation cannot begin.
The Works Manager has the right to request an acceptance check, with the aim of ascertaining whether the elements to be installed have the characteristics declared by the Manufacturer; the Works Management and the Tester reserve the right to have non-destructive samples of materials carried out to be tested according to the regulations.
The costs relating to the execution of the above tests will be borne by the Contractor.

Relating to components and systems in place
Where required by the project or by the Works Management, the approval of the samples referred to in the previous paragraph is in any case subject to the simultaneous approval of the components and systems made on site in order to assess the suitability and relationship between them.

18.7. Tests

During testing, the materials used will be compared with those of the sampling.

The installation of floors of any type or kind must be carried out in such a way that the surfaces are perfectly flat and scrupulously observing the instructions that, from time to time, will be given by the Works Management.
The individual elements must fit exactly together, must be perfectly fixed to the substrate and there must be no inequality in the contact disconnections, the cracks must be almost invisible and their line perfectly straight.
The floors will penetrate 15 mm into the plaster of the walls, which will be pulled vertically up to the extrados of the walls, thus avoiding any connection or shell.
The horizontality must always be scrupulously cared for and controlled by means of a level; undulations of more than 2 mm will also not be allowed, measured by affixing a 2 m long ruler to the floor.
All floors must be of uniform colours according to the prescribed colours and qualities and free of any stain or defect throughout their extension.
The Contractor will therefore be responsible for the costs of levelling, sanding, cleaning and preserving the floors that may require such operations.

They will be carried out as specified in the General Tender Specifications, with the following clarifications:
Provisional testing
It will consist of verifying the correctness of the installation, the surface condition, the uniformity of coloring, the verticality and horizontality of the planes, compliance with any slopes, the coplanarity and alignment of the joints.
Pieces that have imperfections or that are defective or broken must be replaced with others, in perfect condition, by and at the expense of the Supplier.
Final testing
It will consist of verifying that any requirements made during the provisional testing have been complied with and that the works do not show any sign of degradation due to normal use.
Before final acceptance, the surfaces must be perfectly clean.

18.8. Guarantees

The provisions of the General Conditions of Tender, with the following clarifications, apply.
The warranty period will be 10 years, again from the date of the final favorable test report, and must include:
The complete replacement of elements that present defects, cracks, deformations or breakages due to construction and/or assembly defects;
The remaking of coatings that should prove to be defective.
The warranty will also include the labor necessary to carry out any repairs or replacements and related subsidiary materials, as well as the remaking of any damage.

18.9. FL01, FL05 - Interface Syncopation Carpet Floor Finish, Ocean Color, Size 50x50cm

Supply and installation on previously smoothed screed, of carpet covering supplied in self-laying Interface Syncopation type tiles, Ocean color, product code 006484, to be sampled for approval by the D.L., having the following characteristics:

- Tufted Cut & Loop
- Tile size 50x50cm
- 100% Recycled Content Nylon
- Dye Method 100% Solution Dyed
- sweatshirt weight 882 gr/sqm
- Overall height 4.8mm
- Severe wear resistance

The floor must have a coefficient of friction in accordance with the provisions of Presidential Decree no. 503 of 24 July 1996, containing rules for the elimination of architectural barriers in buildings, public spaces and services and non-slip.
The floor will be laid as indicated in the Project drawing on a perfectly level screed, after checking the suitability of the laying surface, using a permanent sticky water-dispersion adhesive such as Mapei's Ultrabond Eco Fix, to be verified with the installation system recommended by the manufacturer; It is recommended to seal with suitable silicone between the tiles making up the new floor and all surfaces (walls, columns, etc.) in order to avoid the presence of cracks through which noise can be transmitted between adjacent rooms.

The price includes and compensates for the verification of the suitability of the laying surface; the cuts, scraps, adhesives, cleaning and removal of the resulting material at the end of the work, the separate collection and transfer with transport to an authorized landfill of the resulting material, the landfill indemnity, compliance with the CE and DOP marking for construction products provided for by Regulation no. 305/2011 (EU) and anything else to give the finished work in a workmanlike manner.

18.10. FL02, FL06 - Cementum-effect porcelain stoneware floor tiles with concrete effect, Ceramiche Marazzi Cementum series, Sand colour, size 60x60cm – WET ROOMS

Supply and installation, on a previously waterproofed screed, of floor covering made of fine porcelain stoneware tiles coloured in mass, rectified type Ceramiche Marazzi Cementum series, Sand colour, dimensions 60x60cm and thickness 10mm, R10 slipperiness, to be sampled for approval by the D.L. Classifiable in the BIa-UGL group, meeting all the requirements of the UNI EN 14411-G standard.
The floor must also have a coefficient of friction in accordance with the provisions of Presidential Decree no. 503 of 24 July 1996, containing rules for the elimination of architectural barriers in buildings, spaces and public services.

Laid with a joint on a previously prepared support, by spreading with a notched trowel with a high-performance white cementitious adhesive, with zero vertical slip, with an extended open time, deformable, with very low emission of volatile organic compounds such as Keraflex by Mapei.

Included and compensated are the sampling of the tiles for the approval of the D.L., the verification of the suitability of the laying surface, the formation of fractionation joints in correspondence with different types of flooring, cutting, scraping, the sealing of the interstices carried out with non-irritating cementitious mortar modified with polymer, anti-efflorescence, for the grouting of joints from 2 to 20 mm, quick-setting and drying, water-repellent with mould-resistant DropEffect with

BioBlock technology, such as Mapei Ultracolor Plus, colour to be defined at the choice of the D.L. to be sampled for approval, surface cleaning, compliance with the CE and PDO marking for construction products provided for by Regulation no. 305/2011 (EU) and anything else to give the finished work in a workmanlike manner.

18.11. FL03, FL07 - Ceramiched, Marazzi stone-effect porcelain stoneware floor tiles Mystone Limestone series, 20mm thick – ENTRANCE/LOBBY and KITCHEN AREA

Supply and installation of floor coverings for the entrance/lobby area and kitchen area, made of fine porcelain stoneware tiles coloured in mass, rectified type Ceramiche Marazzi Mystone Limestone series, thickness 20mm, dimensions and colour to be defined and sampled for approval by the D.L.
Classifiable in the BIa-UGL group, meeting all the requirements of the UNI EN 14411-G standard.
The floor must also have a coefficient of friction in accordance with the provisions of Presidential Decree no. 503 of 24 July 1996, containing rules for the elimination of architectural barriers in buildings, spaces and public services R10.

Laid with a joint on a previously prepared support, by spreading with a notched trowel with a high-performance white cementitious adhesive, with zero vertical slip, with an extended open time, deformable, with very low emission of volatile organic compounds such as Keraflex by Mapei.

Included and compensated are the sampling of the tiles for the approval of the D.L., the verification of the suitability of the laying surface, the formation of fractionation joints in correspondence with different types of flooring, cutting, scraping, the sealing of the interstices carried out with non-irritating cementitious mortar modified with polymer, anti-efflorescence, for the grouting of joints from 2 to 20 mm, quick-setting and drying, water-repellent with mould-resistant DropEffect with BioBlock technology, such as Mapei Ultracolor Plus, colour to be defined at the choice of the D.L. to be sampled for approval, surface cleaning, compliance with the CE and PDO marking for construction products provided for by Regulation no. 305/2011 (EU) and anything else to give the finished work in a workmanlike manner.

18.12. FL10 - Ceramiche Marazzi porcelain stoneware floor tiles Sistem C Città series, white colour, 20x20cm size – WASTE ROOM

Supply and installation in the waste room of floor covering made of porcelain stoneware ceramic tiles such as Ceramiche Marazzi Sistem C Città series, white, frost-proof to be sampled and submitted to the approval of the D.L.
Dimensions 20x20 cm, thickness 8mm.
The floor must have a coefficient of friction in accordance with the provisions of Presidential Decree no. 503 of 24 July 1996, containing rules for the elimination of architectural barriers in buildings, public spaces and services and R11 anti-slip.
Laid on screed, with joints joined by coating with a notched trowel with joints joined in high-performance, highly deformable cementitious adhesive, with zero vertical slip and with extended open time for ceramic tiles, such as Keraflex by Mapei.

Included and compensated are the cleaning and verification of the flatness of the laying surface, the supply of special pieces, cutting, scraping, sealing of the interstices carried out with non-irritating

cementitious mortar modified with polymer, anti-efflorescence, for the grouting of joints from 2 to 20 mm, with fast setting and drying, water-repellent with mold-resistant DropEffect with BioBlock technology, Mapei Ultracolor Plus type color to be defined and sampled for approval by the D.A., surface cleaning, compliance with the CE and DOP marking for construction products provided for by Regulation no. 305/2011 (EU) and anything else to give the finished work in a workmanlike manner.

18.13. VF01 – Cement-effect porcelain stoneware wall tiles such as Ceramiche Marazzi Cementum series in Sand colour, dimensions 60x60cm – GROUND FLOOR WET ROOMS

Supply and installation of wall cladding made of fine porcelain stoneware tiles coloured in concrete effect such as Ceramiche Marazzi Cementum collection in Sand colour, size 60x60cm, thickness 10mm, to be sampled for approval by the D.L.
The product complies with the UNI EN 14411 App G (BIA group) UGL standard.
Features:
- frost-proof;
- Resistant to deep abrasion ≤ 175 mmc;
- Greenguard certification.

Cutlery with a single joint by coating with a notched trowel of high-performance improved cementitious adhesive with zero vertical slip and with open time, such as Adesilex P9 by Mapei or similar approved at the choice of the D.L.
The installation of tile floors and walls must be coordinated taking into account the continuity between horizontal and vertical joints.

The price includes and compensates the costs for installation as indicated in the project, the supply and installation of the adhesive, the special pieces, the sealing of the interstices carried out with non-irritating cementitious mortar modified with polymer, anti-efflorescence, for the grouting of joints from 2 to 20 mm, with rapid setting and drying, water-repellent with mold-resistant DropEffect with BioBlock technology, Mapei Ultracolor Plus type, colour to match the colour of the tile, to be defined at the choice of the D.L. to be sampled for approval, surface cleaning, compliance with the CE and PDO marking for construction products provided for by Regulation no. 305/2011 (EU) and anything else to give the finished work in a workmanlike manner.

18.14. VF02 - Ceramiche Marazzi porcelain stoneware wall tiles Sistem C Città series, white colour, 20x20cm – WASTE ROOM

Supply and installation in the waste room of wall cladding made of porcelain stoneware ceramic tiles such as Ceramiche Marazzi Sistem C Città series, white, frost-proof to be sampled and submitted to the approval of the D.L., including the installation of corner coving on the floor.
Dimensions 20x20 cm, thickness 8mm.
Cutlery with a single joint by coating with a notched trowel of high-performance improved cementitious adhesive with zero vertical slip and with open time, such as Adesilex P9 by Mapei or similar approved at the choice of the D.L.
The installation of tile floors and walls must be coordinated taking into account the continuity between horizontal and vertical joints.

The price includes and compensates the costs for installation as indicated in the project, the supply and installation of the adhesive, the special pieces, the sealing of the interstices carried out with non-irritating cementitious mortar modified with polymer, anti-efflorescence, for the grouting of joints from 2 to 20 mm, with rapid setting and drying, water-repellent with mold-resistant DropEffect with BioBlock technology, Mapei Ultracolor Plus type, colour to match the colour of the tile, to be defined at the choice of the D.L. to be sampled for approval, surface cleaning, compliance with the CE and PDO marking for construction products provided for by Regulation no. 305/2011 (EU) and anything else to give the finished work in a workmanlike manner.

18.15. VF06 - Ceramiche Marazzi stoneware wall tiles Colorplay series in Sage colour, size 30x90cm – KITCHEN BACKSPLASH

Supply and installation of wall cladding, for an H as per the project drawings to be placed on the walls of the kitchen, made of white-body technology stoneware tiles, type Ceramiche Marazzi Colorplay series colour Sage, product code M4J8, dimensions 30x90cm and thickness 10mm, to be sampled for approval by the D.L.
Cutlery with a single joint by coating with a notched trowel of high-performance improved cementitious adhesive with zero vertical slip and with open time, such as Adesilex P9 by Mapei or similar approved at the choice of the D.L.
The installation of tile floors and walls must be coordinated taking into account the continuity between horizontal and vertical joints.

The price includes and compensates the costs for installation as indicated in the project, the supply and installation of the adhesive, the special pieces, the sealing of the interstices carried out with non-irritating cementitious mortar modified with polymer, anti-efflorescence, for the grouting of joints from 2 to 20 mm, with rapid setting and drying, water-repellent with mold-resistant DropEffect with BioBlock technology, Mapei Ultracolor Plus type, colour to match the colour of the tile, to be defined at the choice of the D.L. to be sampled for approval, surface cleaning, compliance with the CE and PDO marking for construction products provided for by Regulation no. 305/2011 (EU) and anything else to give the finished work in a workmanlike manner.

18.16. HF01 – Mapei Mapefloor System 32 epoxy multilayer coating, 3mm thick on concrete substrate

Creation of a Mapei Mapefloor System 32 epoxy multilayer floor covering, final thickness 3 mm on a concrete support, in order to obtain an industrial floor with high chemical resistance, impermeable to oils and aggressive agents, resistant to frequent washing, wear and tear caused by trolleys and moving vehicles and with a marked anti-slip effect, carried out through the following processes:
Preparation of the concrete substrate by mechanical operation carried out with suitable mechanical equipment (shot peening machine or sander with diamond discs) in order to make the surface slightly rough and absorbent.
Subsequent application of Mapei Mapefloor I 911 epoxy primer plus quartz dusting on the cementitious substrate to consolidate the substrate and create the anchoring bridge to the next coating, applied in two consecutive layers.

Application of a coat of epoxy resin such as Mapei Mapefloor I 370 SL, a colour to be defined and sampled for approval by the D.L.
The two parts of Mapefloor I 370 SL must be mixed together when using them. Stir component A thoroughly, then pour in all the contents of component B. Stir with a suitable electric mixer at low speed to avoid air incorporation (300-400 rpm), for at least 2 minutes and in any case not after complete homogenization. Pour the mixture into a clean container and stir briefly.
Avoid excessive mixing times to reduce the amount of air engulfed. Apply the mixture within the useful life time indicated in the table referred to at +23°C.
With higher ambient temperatures, the service life time decreases, vice versa, with lower temperatures, it increases.
Application of a roller coat of pigmented epoxy resin such as Mapei Mapefloor I 370 SL, light grey colour to be sampled for approval by the D.L. to make the support of colour and effect continuous.

On the project, the resin finish will be laid on the following stratigraphies:
- ST05: internal staircase cladding, risers and treads.

The price includes the costs for the preparation of the substrate, the sampling of the finish for the approval of the D.L., the preservation of the passage openings of the systems, of the expansion and structural joints if present in the premises, the supply and installation following the instructions of the supplier of all the components of the system, the cleaning and delivery with transport to any road distance of the resulting material in the authorized center for the collection of special non-hazardous waste, the indemnity due for disposal and anything else necessary to give the finished work in a workmanlike manner.

18.17. HF02 - Floor finish with colloidal hardener

Realization of floor finishing with the PRIMA POLISHING SYSTEM, a procedure consisting of different phases and as described below, to be carried out in the listed environments:
- GROUND FLOOR: MEP Gallery, technical rooms and DC building depots, corridors, office block (FL14);
- FIRST FLOOR: for DH corridors, MEP Gallery and elevator landing (FL08).

Laying of a protective transparent coating, a high-performance hardener for industrial flooring such as Pentra-Guard® (HP): Inorganic/organic hybrid Nano Lithium™ surface treatment that forms a microfilm to harden and seal concrete floors, creating a very hard, dust-repellent and chemical-resistant waterproof surface.
This industrial-grade, fast-curing treatment provides a glossy, clear finish and ease of application in facilities that require maximum protection and little to no downtime. The treatment has an extremely low VOC content (less than 50 grams/liter), is environmentally friendly (Green Leaf) and releases a very faint ammonia odor.
Pentra-Guard® (HP) hardens concrete, makes it resistant to stains, facilitates maintenance and improves reflection (on smooth finishes), it does not significantly reduce the coefficient of friction of surfaces.

CHEMICAL STRUCTURE

The chemical composition creates a permanent and insoluble cohesion with concrete surfaces, drying quickly (dry to the touch in 30 - 60 minutes) to form a thin protective film (0.05 - 0.07mm). Due to its adhesion properties, it won't flake or chip.
After curing on the surface, the substrate no longer absorbs water and does not change its alkalinity.
The treatment is suitable for indoor applications only.
Thanks to a lower viscosity than traditional treatments, it penetrates deeper into the hair pores to ensure even hardening.
After penetrating the porous surface of the concrete, Pentra-Guard® (HP) undergoes a series of chemical reactions that strengthen and seal the surface of the concrete by forming a long-lasting bond with the surface itself, ensuring long-lasting protection.
Drying time: 1-2 hours

APPLICATION
Apply to new or existing concrete surfaces using applicator and microfiber pad.
Step 1
Cleaning: Pentra-Guard® (HP) can be applied to existing matured concrete surfaces of any age.
Clean all surfaces thoroughly. Mechanically remove all traces of latex from the surface, seal cracks and restore damaged areas. Remove all membranes, sealants, oil, grease, dirt, dust, gypsum residues etc. We recommend cleaning the surface thoroughly with a black (fine-grained) pad and a pH-neutral detergent.
For best results, clean the surface by sanding the floor with a 60-100 grit paper or diamond grinding wheel.
Remove dust and any residue with a walk-behind or ride-on scrubber, using water or a broom, then rinse with water and dry the surface with a squeegee.
Step 2
Before continuing, allow the surface to dry.
Step 3
Stir or shake the product thoroughly before application.
Apply and distribute the product in a thin, even layer until the substrate is completely covered. Depending on the porosity of the surface, spread the product in proportions of 37 – 74 m²/l. Repeat until you get the desired result. The purpose of this phase is to create a very thin and stain-resistant film on the substrate.
Allow each coat to dry for at least 30 - 60 minutes (very important!) before moving on to the next one. It is essential to apply several very thin coats. Layers that are too thick will not harden properly and the substrate may become discolored or bleached. After each application, use a high-speed polisher and a natural bristle pad to increase the shine and accelerate the treatment action.
Make sure you have the latest update of the Technical Data Sheet and the Product Safety Data Sheet for correct execution.

Laying of a quality densifying product based on lithium polysilicate for the treatment of concrete surfaces such as Pentra-Sil (NL): its formula with a high content of solids guarantees optimal hardening to improve abrasion resistance and limit the formation of dust. It is an easy-to-apply, water-based solution that does not require any washdown and complies with current VOC regulations.

After application to new or existing concrete, the product penetrates the substrate to a depth of 7 mm and reacts with the free lime to form insoluble hydrated calcium silicate which makes the concrete more resistant to water, stains and abrasion, thus facilitating the maintenance of the substrate and increasing its life.
It can also be used for concrete polishing in order to increase the durability of polished surfaces.

This includes the supply of the material on site, its spreading, compaction, compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

18.18. SK01 - Wooden plinth H 4cm white colour – OFFICES

Supply and installation on the walls of the offices and as indicated in the project drawings, of a wooden skirting board H 4cm, thickness 1cm, painted white RAL 9016 to be sampled for approval by the D.L., fixed to the walls by nailing or glue.

Included are sampling, cutting according to project shapes, scraps; the uniformity and linearity of the installation; the state-of-the-art corner joints and fittings, the fixing system, the masonry assistance, compliance with the CE and DOP marking for construction products provided for by Regulation no. 305/2011 (EU) and anything else to give the finished work in a workmanlike manner.

18.19. SK02 – Plywood panel plinth 13mm thick, H 110cm from finished floor – SERVICE AREAS

Supply and installation, on the walls of the service areas and as indicated in the project drawings, of plinth made of 13mm thick plywood panel, for a total height H of 110cm from the finished floor level, to be sampled for approval by the D.L., fixed to the walls by means of mechanical dowels suitable for the building context behind in order to protect it.

Included are sampling, cutting according to project shapes, scraps; the uniformity and linearity of the installation; the state-of-the-art corner joints and fittings, the fixing system, the masonry assistance, compliance with the CE and DOP marking for construction products provided for by Regulation no. 305/2011 (EU) and anything else to give the finished work in a workmanlike manner.

18.20. SH06 - Metal threshold for external doors

Supply and installation of a metal threshold for external doors, laid as described in the project drawings, made of almond sheet metal, 15cm deep, length equal to that of the door where it will be installed.
Made of natural aluminium metal sheet, to be sampled for approval by the D.L., thickness 4/10mm, equipped with punctual knurling along the entire length of the surface, suitable for ensuring an R10 anti-slip coefficient.
Laid at the level of the finished floor by spreading a suitable adhesive until it reaches the floor, and further fixed with countersunk stainless steel screws.

The price includes and compensates for the costs for laying according to the design shapes, cutting and scrapping, the adhesive for fixing the profile, compliance with the CE and DOP marking for construction products provided for by Regulation no. 305/2011 (EU) and anything else to give the finished work in a workmanlike manner.

18.21. CU04 – Barrier for the protection of glycol water in Data Halls

Supply and installation of a barrier for the protection of glycol water and diesel in the Data Halls and as described in the project drawings, carried out by means of eco-barriers such as EMTEZ product code BAR150 (S/P) of orange or similar color to be sampled and submitted to the approval of the D.L.
Safety barriers in company areas that serve to protect hazardous areas, permanently or temporarily, quickly and cost-effectively, and to prevent spills of hazardous substances or rainwater intrusion.
They are suitable for both outdoor and indoor use
Strong resistance to mechanical wear and hazardous substances
Trailerable for the passage of trolleys, cars, trucks, etc.
Can be fixed to the floor with silicone or dowels.
Standard dimensions: 1500 x 100 x 60 mm

Main properties:
Made of polyurethane with long life guarantee.
Temperature resistant from -30°C to + 100°C.
Good resistance to hydrolysis.

Soil preparation
Vacuum and remove grease/oil using suitable solvents.
You can cut and split the "custom" barrier into length using a metal saw.
Make sure that the barrier is stretched out when cutting so as not to create tension.

Fixing:
To ensure proper assembly, holes must be drilled in the ground at a depth of 60 mm and Ø 6 mm.
After drilling, clean the holes so that the screws fit snugly.
Precise mounting is essential to ensure proper operation.

Connector for 2 barriers
Assemble the connector, with the screws, in the same way as described for the barrier.
Use silicone between the connector and the barrier.
Mount the connector in a place where it cannot be damaged by the passage of the wheels of the truck, forklift etc.

Barrier angle
The easiest way to make the corner is through the use of a barrier corner.
To achieve a secure and tight connection between the corner and the barrier, use the connector.
Fit the corner as described for the barrier and connector.

Chemical and physical characteristics:
Density: 1.1 kg/dm3
Hardness: 80 Shore A

The price includes and compensates for the costs for laying according to the design shapes, cutting and scrapping, the adhesive for fixing the profile, compliance with the CE and DOP marking for construction products provided for by Regulation no. 305/2011 (EU) and anything else to give the finished work in a workmanlike manner.

19. SUSPENDED CEILINGS

19.1. Generality

All the false ceilings envisaged in the project, whatever the type or construction system, must be made with particular care, in order to obtain exactly horizontal or shaped or inclined surfaces according to the project prescription, without undulations or other defects so as to absolutely avoid the formation, in a more or less near time, of cracks, cracks, detachments in the plaster.
The installation must always be carried out in compliance with the assembly diagrams and materials prescribed by the supplier companies or according to the scheme produced by the Contractor and approved by the Works Management.
From the lower face of all false ceilings, if ordered, the steel hooks must protrude.
The metal supports will be treated with anti-rust or anti-corrosive paints.
For the ventilation of the cavities, special grilles (in PVC, aluminum, or enameled sheet metal) will be set up to be placed in the number and position that will be established by the Works Management.
False ceilings will generally consist of panels of standardized dimensions, in the assembly of which carried out in adherence or with detachment from the surface to be covered, care must be taken to achieve the best coplanarity and perfect adherence of the edges.
The installation must always be carried out in compliance with the assembly diagrams and materials prescribed by the suppliers or according to the scheme produced by the Contractor and approved by the Works Management.
The panels must be easily removable to allow replacement or inspection of any cavities above.
In addition, in the execution, a perfect agreement will be required between the companies executing the systems, whether electrical, thermal or air conditioning in general.

19.2. Method of execution

Obligations to be observed in the execution of false ceilings
During the execution of the false ceilings, the necessary measures must be taken to avoid any damage due to mechanical actions.

Supplies
The installation must always be carried out in compliance with the assembly diagrams and materials prescribed by the supplier companies or according to the scheme produced by the Contractor and approved by the Works Management.
In the execution, a perfect agreement will be required between the companies executing the systems, whether electrical, thermal or air conditioning in general.
The suspension of the false ceilings must be carried out as indicated on the drawings and technical sheets attached and prepared by the supplier companies.
The tie rods and brackets must be positioned in such a way as to avoid pipes, ducts, cable trays, air channels and not to interfere with the positioning of lighting fixtures, anemostats, grilles, fire extinguisher heads, etc.
The presence of these impediments could increase the number of tie rods provided.
In the event that the obstacles mentioned above are located on the suspension axes of the false ceiling, U-bolt tie rods must be used.
Direct tie rod attachments to the underside of pipes, channels, walkways, etc. will not be permitted.

Handling and storage: Use cut-resistant gloves and clothing with long sleeves and trousers. Storage in boxes on pallets; packaging protected with cardboard corner protectors and externally expandable film; Check the tightness of the packaging and store the material in dry and ventilated places, absolutely do not allow the product to come into contact with water or corrosive liquids or to be exposed to light or direct heat sources.
Upon their arrival at the construction site, the baffles must be placed away from the weather and dirt resulting from the activities of the construction site itself, and be arranged horizontally.
The lowering height of the false ceiling is obtained from the sum of the pendant/hook, the metal frame and the cladding.
Fixing to the slab: the fixing of hooks and hangers must be carried out with suitable dowels to be identified according to the type of support and the loads to be supported.
Hang with the suspension systems to be chosen according to the load or any laboratory tests used (fire protection, sound insulation, etc.).

SPECIFICATION OF PLASTERBOARD COUNTERTOPS
In humid environments, the use of anti-humidity and anti-mold plasterboard is prescribed.
Factory drawings
They must clearly indicate all types of products and their position, interference with lighting fixtures, grids and anemostats, indicate all construction details such as: fasteners, joints, joint covers, etc.
Method of installation
The suspension of the false ceilings must be carried out as indicated on the drawings and technical sheets attached and prepared by the supplier companies.
The presence of these impediments could increase the number of tie rods provided.
In the event that the obstacles mentioned above are located on the suspension axes of the false ceiling, U-bolt tie rods must be used.
Direct tie rod attachments to the underside of pipes, channels, walkways, etc. will not be permitted.
The materials with which the gratings will be made, the dimensions of the panels, the dimensions of the grid and the color are indicated on the project drawings.
The suspension devices must be of the invisible type and allow easy disassembly and reassembly of the panels.
It will be the responsibility and responsibility of the Contractor, based on the type of lighting fixture chosen, to provide the suspension devices of the same to allow them to remain in place even if all the panels are disassembled.
During the bidding phase, the Contractor must provide the value of the resistance to operating shocks.
False ceilings with metal frame and covered gypsum sheet cladding
Generality
The supply and installation of false ceilings, with a metal frame and cladding in coated gypsum slabs, will be carried out with a metal frame formed by galvanized steel profiles Fe P02 G Z 200 of adequate thickness according to DIN 18182 of the dimensions indicated, placed at the project center distances and isolated from the perimeter structures with single-sided adhesive vinyl tape with acoustic cutting function, 3.5 mm thick.
The U-shaped guides will be rigidly locked to the ceiling and floor with suitable fixings placed at a distance of no more than 900 mm and at the base of the door uprights.

The vertical C-shaped upright profiles equipped with holes for systems inserted in the U-shaped guides.
The following are included in the scope of delivery:
Adhesive acoustic gaskets on perimeter profiles in contact with structures;
Raised floor guide with special Z and L supports, where necessary;
Reinforcement on the door uprights with boxed C-profile;
Insulation with mineral wool panel of the thickness indicated in the project inserted by pressure with continuity in the space between the uprights, where required.
The covering of the frame will be made with plaster sheets coated according to DIN 18180 of the required thicknesses fixed to the metal frame with phosphate self-drilling screws.
The on-site supply will include the grouting of the joints, corners and screw heads in order to obtain a surface ready for finishing.
The coated gypsum boards consist of a gypsum core whose surfaces and longitudinal edges are coated with special perfectly adherent cardboard.
They can be processed further, for example: cut, drilled, milled and slotted. The gypsum core contains additives to improve its characteristics.
The surface should be flat and smooth.
The large format of the slabs must allow simple application either by means of screws or with adhesive plaster on support surfaces and allow easy processing (with a saw and knife) and an equally easy grouting.
The dimensional stability of gypsum slabs must allow a crack-free application, if done in a workmanlike manner, regardless of their thickness.
Coated gypsum sheets must have the ability to quickly absorb, retain and return the humidity of the environment; The quality absorbed depends essentially on the type and shape of the plates.
Coated gypsum boards must have the ability to protect the substructure from flames and reduce their effect. The effectiveness of the protection depends on the type and thickness of the slabs.
Fireproof coated gypsum welds for fire protection are used when greater fire protection is required.
Coated gypsum hydroslabs are impregnated in environments with high humidity and subjected to possible water sprays.
Distinction
All coated gypsum sheets must be stamped on the back of the cardboard fibres with the name of the company and the abbreviation of the type.
Delivery
At the time of delivery, the factory must issue a delivery note with the following information:
Name and location of the establishment;
Abbreviation of the type of slabs and formation of the edges, thickness, length and width of the same and any processing;
Quantity;
Date of delivery;
License plate of the transport vehicle.
Nature and form
The core of the sheets consists mainly of gypsum and must contain only additives that cannot cause negative transformations (for example: efflorescence). The core of gypsum sheets coated for fire protection and hydrofire-sheets for fire protection impregnating must contain fibres of glass wool and/or other inert material suitable for improving the cohesion of the structure under the effect of

combustion. The glass wool fibres must comply with DIN 61850, be 3 to 30 mm long and be distributed in the core as evenly as possible.
Impregnated hydro sheets and impregnated fire protection hydro sheets contain water-repellent additives in both the cardboard and the core to reduce water absorption.
The slabs listed are rectangles and have a compact and flat visible face.
Squareness
The maximum allowable error on the right angle must be less than 0.3% of the width of the plates.
For format slabs, the maximum tolerances are:
on length ± 0.15% of the required size;
on squareness: 0.2% of the width.

Thickness nominal D Mm	Distance between supports of the strips of Slabs (I:d=const. =40) Mm	Tensile strength (maximum variation of one Single value – 10%)				Average deflection f=ff - ff with load max. Ff (maximum variation of one single value + 10%)		
		Fire protection sheets normal and water-repellent		Plaster substrate slabs		Normal and water-repellent fire-fighting sheets		
		Loading of strips in the cardboard fiber direction						
		Longitudinal		Transversal		Transv.	Longit.	Transv.
		A*)	B*)	A*)	B*)			
		N (≈ 0.1 Kp)				Mm		
9,5 12,5 15,0 18,0	380 500 600 720	220	180	600	500	40 - - -	2,0	1,5
25,0	1000					-	Exposed and back	
* Case A: Exposed cardboard at the point of traction * Case B: back of the carton at the point of traction								

Water absorption (applies to hydroplates and hydrofires)
After the two-hour immersion test, the absorption must be a maximum of 10% of the weight.
Cohesion of the structure with heat effect (high temperature test)
The slabs subjected to high temperature tests must withstand for a duration of 30 minutes. This examination shall demonstrate the effect of the inert material as indicated in the requirements.
Metal frames
In steel type FE P02 G in accordance with UNI EN ISO 1461:2009 for profiling, with hot-dip galvanizing skimmed and chromic acid passivated, Z200 g/sqm.
Dimensions and tolerances
Steel thickness nominal ± 10%
Section nominal ± 0.2 m/m on 3.00 ml
Length nominal ± 5 m/m.
Features

U-shaped guide profiles with ∅ 8 m/m holes for dowels, placed at a distance of 45 cm.
C-shaped profiles with knurled and differentiated wings to allow joining and pairs of 30 ∅ m/m holes for systems, placed at 38 cm axis of the ends.
Steel
Complies with EN 10142 standards.
Complies with UNI 5753/94 standards for flat finished products in non-alloy steel.
Tensile strength: unit tensile strength R 270 N/mm.
Classification: 1st choice, type FE P02 G for profiling.
Zinc Z 275 and Z 200
Complies with UNI 5753/94 standards for first casting.
Quantity Zn 98%, compliant with UNI 2013 standards.
Protective mass on each face:
Z 275 = 137.5 gr/sqm = 9.81μ
Z 200 = 100gr/sqm = 7.14μ
Complies with the thickness tolerance ± μ 0.01, lower than that established by the UNI standard on the average measurement of the tests: Z 275 and Z 200 gr/m2.
Surface protection
Chemical passivation to chromatic steel;
Oiling in profiling;
72-hour salt spray resistance.

SPECIFICATION OF METAL BAFFLES COUNTERTOPS
Metal Baffle with single frame - Recommended configuration for Baffles weighing ≤ 10kg/sqm
ELEMENT DIMENSIONS: 20 x 60 sleeper base 20 - 25 x 50 sleeper base 25
(30 x 64 | 100 | 150 | 200 | 300) (40 x 100 | 140 | 180) (50 x 100 | 150 | 200 | 300) TRB sleeper with predefined variable pitches
TS sleeper and/or oversized bases - Max. length Baffle 4000 mm.
MATERIALS: Aluminium and steel, thickness depending on the project/product characteristics
STRUCTURE: Interlocking Baffle sleeper in 8/10 pre-painted black steel or post-painted with colour on request. Anti-release system and slotted "U" profiles in 15/10 galvanized steel
ANTI-SEISMIC DEVICES: Anti-seismic kit for plenum ≤ 1.2 m - Anti-seismic kit for large heights for plenum > 1.2 m
SINGLE FRAME Metal Baffle PENDANT: Double hanger with adjustable spring or threaded rod. Hangers to be evaluated according to the load per m2 and the design characteristics and the anti-seismic kits where provided.
Installation diagram: determination of the height of installation of the false ceiling, hang by hooking the sleepers to the appropriate hangers, according to the center distance calculated according to the project. Proceed with the hooking of the baffles to the sleepers using the appropriate tab. Close the safety tab to ensure anti-release. To ensure correct alignment of the sleepers, secure the appropriate couplings. To ensure continuity between the baffles, insert the appropriate connecting element. Where required, install the blanking cap.

Metal Baffle with double warp - Recommended configuration for Baffles weighing > 10kg/sqm
ELEMENT DIMENSIONS: 20 x 60 sleeper base 20 - 25 x 50 sleeper base 25

(30 x 64 | 100 | 150 | 200 | 300) (40 x 100 | 140 | 180) (50 x 100 | 150 | 200 | 300) TRB sleeper with predefined variable pitches
TS sleeper and/or oversized bases - Max. length Baffle 4000 mm.
MATERIALS: Aluminium and steel, thickness depending on the project/product characteristics
STRUCTURE: Interlocking Baffle sleeper in 8/10 pre-painted black steel or post-painted with colour on request. Anti-release system and slotted "U" profiles in 15/10 galvanized steel
ANTI-SEISMIC DEVICES: Anti-seismic kit for plenum ≤ 1.2 m - Anti-seismic kit for large heights for plenum > 1.2 m
DOUBLE WARP Metal Baffle PENDANT: Threaded bar with bracket for slotted "U" fixing.
Installation diagram: draw the lines of the perimeter frame; determine the height of the false ceiling, fix the threaded rod to the floor. Hang the "U" profile by hooking the threaded rod bracket onto the profile and bar. Then tighten the nut to secure the profile. Fix the sleepers to the slotted "U" profiles using M6x16 screws and nut. Proceed with the anchoring of the baffles to the sleepers using the appropriate tab. Close the safety tab to ensure anti-release.
To ensure correct alignment of the sleepers, secure the appropriate couplings. To ensure continuity between the baffles, insert the appropriate connecting element. Where required, install the blanking cap.

Metal Sliding baffle: structure consisting of special Sliding brackets in 8/10 pre-painted black steel for sliding on TS-SLIDING sleeper in 10/10 pre-painted black steel.
Anti-seismic devices: Mandatory anti-seismic kits for Class 3 and 4 buildings (NTC 2018 - 7.2.3). Hanging with threaded rod.
The cross-system load-bearing structure consists of:
- TS-Slidding model sleepers, in 10/10 thick steel pre-painted black, available in a length of 4000mm.
- slotted "U" profiles, measuring 30x20x30 mm, in galvanized steel with a thickness of 15/10, available in a length of 4000mm and laid with a center distance of 1200mm in a perpendicular direction with respect to the sleepers. The Baffles will be hooked, using special brackets, to the load-bearing sleeper described above. The latter will have step holes in which the bracket must be fixed with the use of the pin clips for locking. The special bracket will also have bosses for self-centering to allow quick repositioning on the sleeper.
The suspension of the sleepers from the ceiling is done by means of rigid hangers made with M6 threaded rod.

19.3. Reference legislation

- UNI EN ISO 20482:2014 Metallic materials – Sheets and strips – Erichsen test
- UNI EN 317:1994 Wood particle board and wood fibre board. Determination of thickness swelling after immersion in water
- EN ISO 354:2003 Acoustics - Measurement of sound absorption in reverberation rooms.
- UNI EN 12354-1:2017 Acoustics in construction - Evaluation of the acoustic performance of buildings starting from the performance of products – Part 1: airborne noise insulation between rooms

- UNI EN 12354-2:2017 Acoustics in construction - Evaluation of the acoustic performance of buildings starting from the performance of products - Part 2: impact sound insulation between rooms.
- UNI EN 10152:2017 Cold-rolled, electrolytically galvanized, cold-formed flat steel products – Technical supply conditions.
- DIN 18230 and ISO normalized curve Determination of the fire resistance of structures.
- UNI EN 13964:2014 False ceilings - Requirements and test methods
- UNI EN 14195:2015 Metal framing components for gypsum panel systems - Definitions, requirements and test methods
- UNI EN 13381 Test methods for determining the contribution to the fire resistance of structural elements.
- UNI EN 14353:2017 Metal profiles for use with gypsum sheets – Definitions, requirements and test methods.
- ISO 9053-2:2020 Acoustic – Determination of airflow resistance – Part 2: Alternating airflow method
- UNI EN 10346:2015 Continuous hot-dip coated flat steel products for cold forming - Technical delivery conditions
- UNI EN 13501-1:2019 Fire classification of building products and elements - Part 1: Classification based on the results of reaction to fire tests.

19.4. Acceptance Requirements

The materials must correspond to what is indicated in terms of the technical characteristics of the individual materials.
The works manager, for the purpose of accepting the supply, may request a declaration of performance and technical sheet.
For each batch of materials that it will use in the preparation of the products, the Contractor must provide the Works Management with the relevant certificate of origin valid for one year from the date of issue or from the test certificates issued by official laboratories, in particular for tests relating to the physical-mechanical characteristics.
The supply must be accompanied by the production mark that can be found on the appropriate label on the packaging.

19.5. Performance Specifications

All the services listed in the contractual documents to give the completed works as specified in this specification, in particular the following.

Contractor's charges and obligations included in the on-site supply

All the services listed in the contractual documents to give the completed works as specified in this specification, in particular the following.
Before the start of the installation of the materials, it will be the responsibility of the Contractor to verify that the environmental conditions of the construction site, as regards internal temperature and humidity, do not represent a risk of degradation of the material and finishes.
The control of the masonry works already carried out in which the artifacts covered by this technical specification must be inserted.
This inspection must be carried out promptly so that any necessary restoration work can be carried out in time to comply with the work schedule.
Supply of materials, unless otherwise decided at the time of ordering.
The supply of all the suspension elements of the false ceiling to the structures above.
Edging around the perimeter and around the holes drilled in the false ceiling for lighting fixtures, anemostats, grids, etc.
Supply and installation of all the connections between the false ceiling and the vertical elements of the structure or anything else that crosses the false ceiling in question.
Materials, equipment, specialized and ordinary labor for the installation of the false ceiling.
Transport, unloading, storage, protection and custody of materials in environments prepared by the Contractor.
Various transport equipment from the warehouse to the place of use.
Equipment, specialized and ordinary labor for the installation of materials.
Rooms suitable for: shelter, changing room, refectory, etc. for the Contractor's staff, as required by current health and safety regulations in the workplace.
Power and water lines from existing on-site gripping points to user tools.
The filling, supply and fixing of any metal elements placed in the castings, anchors, fasteners and other inserts.
Cleaning and all the necessary protections to avoid any and all damage to the finished works.
The restoration of any works damaged during the installation of materials.
The transport from the places of installation and the stacking within the construction site, in a fenced area, previously indicated by the Works Management, of the waste and waste materials. The cleaning of the areas used for the stacking of materials and waste.

19.6. Sampling/testing methods

Relating to individual components
The Contractor shall submit a double set of samples of the manufactured goods and accessories for approval. These samples must be approved by the Works Manager: one series will be kept by the Contractor and one series by the Client.
The Works Manager has the right to request an acceptance check, with the aim of ascertaining whether the materials to be installed have the characteristics declared by the Manufacturer.
The Works Management and the Tester reserve the right to have samples and samples of materials carried out, as well as for legal checks, also for checks during construction.
During the bidding phase, the Contractor must present all the certification relating to the performance required for the types of false ceilings envisaged. Also during the bidding phase, the Contractor must communicate the maximum load expected on the suspension tie rods in order to verify the suitability of the attachment points.

The costs relating to the execution of the above tests will be borne by the Contractor.

Relating to components and systems in place
Where required by the project or by the Works Management, the approval of the samples referred to in the previous paragraph is in any case subject to the simultaneous approval of the components and systems made on site in order to assess the suitability and relationship between them.
At the beginning of the works, a sample of false ceiling laid on site with an area of about 10 square meters will be submitted for approval; This sample must represent all the most significant nodes.
Tensile tests will be carried out on the suspension tie-rods of the false ceiling with a load double that which will actually be transmitted, maintained for a period of 24 hours. During this test, it will be checked that there are no loosening phenomena of the attachment points of the structure.

19.7. Tests

The following tests will be carried out.
Provisional testing
The correspondence of the works carried out to the project and the compliance of the materials used with the requirements set out in this technical specification will be ascertained.
Checks are provided for correct assembly, dismountability, coplanarity, surface condition, alignment of the joints, uniformity of color, etc.
Final testing
It will consist of verifying that any requirements made during the provisional testing have been complied with and that the works do not show any degradation.
The surfaces must be thoroughly cleaned and free of stains, dirt and other defects. Pieces that have imperfections, are broken, or defective, must be removed and replaced with others in perfect condition.

19.8. Guarantees

The provisions of the General Conditions of Contract, with the following clarifications, apply.
The warranty will include the following:
The replacement of elements that have assembly defects, deformation or breakage due to construction defects;
Any remaking of the paintwork that may prove to be defective if these had been carried out by the supplier of the false ceiling;
Any remaking of paintwork carried out by third parties who had suffered damage as a result of defects relating to the false ceiling;
The reimbursement of damages relating to the restoration of the premises affected by any renovation works.

19.9. CE01 – Inspectable false ceiling in mineral fiber tiles

Supply and installation of an inspectable internal false ceiling made of modular plaster panels covered with Knauf type or similar, to be sampled and submitted to the approval of the D.L., consisting of:
- metal support frame on a hidden T-shaped structure in galvanized steel consisting of primary profiles installed at a distance of 1200mm;

- the secondary T-profiles will be installed at a distance of 600mm to form a structural mesh of 600x600mm;
- coated plaster panel, 9.5mm thick.

False ceiling laid at height as established in the project drawings.

The cutting and scrap of the slabs, the formation of perimeter shutters where required, the creation of holes for the insertion of any lighting fixtures or plant elements are included and compensated; any structural reinforcements for the application of heavy loads; any specific solutions at the structural joints, the formation and unraveling of the work surfaces, as well as compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

19.10. CE03 - Lowered false ceiling in single sheet of water-repellent plasterboard – WET ROOMS

Supply and installation of a lowered internal plasterboard false ceiling made of a single sheet of water-repellent plasterboard, on a double metal frame regardless of the floor above, with the following characteristics:
- double load-bearing frame in galvanized sheet metal, not overlapping for the pended parts
- GKI water-repellent plasterboard sheet, th. 12.5 mm

Metal frame made of 0.6mm thick DX51D+Z-N-A-C galvanized steel profiles in accordance with UNI-EN 10142, consisting of: 30x28mm "U" shaped perimeter profiles insulated from the masonry with 3.5mm thick vinyl tape with acoustic cutting function and sealed with stucco and/or silicone to completely fill the cracks at the perimeter joints with the primary structures, to achieve the required acoustic performance.
50x27mm "C" shaped load-bearing profiles for the primary frame placed at a distance of no more than 1000mm fixed to the floor by means of an adequate number of adjustable spring hooks and hangers.
Load-bearing profiles "C" mm 50x27 The secondary frame, placed at a distance of no more than 500 mm, anchored to the primary by means of special hooks.
The profiles will comply with the harmonized standard EN 14195 concerning "Profiles for Coated Gypsum Sheet Systems" with CE certificate of conformity, in class A1 of reaction to fire, produced according to the UNI-EN-ISO 9001-2000 quality system, with production certified by ICMQ.

Covering of the frame made of a single sheet of plasterboard type Knauf GKI (H) or similar to be submitted to the approval of the D.L., in impregnated coated gypsum, subjected to a special procedure to limit the absorption of moisture, in accordance with EN 520 – DIN 18180 having the following technical characteristics:
- Sheet thickness 12.5 mm
- Fire reaction class: A2-s1, d0 (B)
- Density: ≥ 700 kg/m³

- Thermal conductivity λ: 0.20 W/mK
- Water absorption after 2 h of immersion: % ≥ 10
- Thermal conductivity l: 0.20 W/mK
- Vapour resistance factor m: 10 dry - 4 wet
- Tested from a biological-housing point of view as per the certificate issued by the Rosenheim Institute of Bioarchitecture,

Screwed with phosphated self-drilling screws with flat countersunk head, laid at staggered joints and with a centre distance of 600mm.
The on-site supply will include the grouting of the joints, corners and heads of the screws as well as the grouting and sealing of the joints where the slabs are approached, carried out with suitable grout after the application of support strips reinforced with textile mesh, the state-of-the-art joint with the false ceiling to be compensated, the subsequent grouting of the surface of the slabs, in order to obtain a surface ready for finishing.
The installation will take place according to the procedures prescribed in the UNI 11424:2015 standard and subsequent amendments and additions, which specifies the guidelines for the execution of partitions using a system with coated gypsum slabs.
The painting of the false ceilings in the RAL color is planned to be defined and sampled for approval by the D.L.

The costs for the formation of provisional works for the execution of the works in safety, and subsequent dismantling, the temporary protection of floors and elements present within the intervention area with the laying and relative final removal of special protective sheets are included and compensated; the supply and installation of insulation, the cutting and scrapping of the slabs, the grouting of the joints of the slabs and the heads of the screws, the formation of perimeter shutters if provided for in the project, the creation of holes for the insertion of any lighting fixtures or plant elements, any structural reinforcements for the application of heavy loads; any specific solutions at the structural joints, the charges for the acoustic closure of plant penetrations of any type and nature; the burden of proceeding after the application of the slabs pending the execution of electrical and thermo-hydraulic systems to be inserted, the Certification and acoustic testing if required in the project, as well as compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

19.11. CE04, TD02 – Self-supporting insulated fire-fighting false ceiling with inspection hatch, total thickness 12.50cm

Supply and installation of self-supporting internal false ceiling, insulated fire-fighting, EI120, total thickness about 12.50cm, to be submitted to the approval of the D.L. and consisting of the following elements:
Promatect 100X sheet with PROMAX engineered matrix, CE marked according to ETA 20/0932 and as a fireproof sheet EAD 350142-00-1106, having the following technical characteristics:
Fire reaction class A1
Bulk density 840kg/mc ± 10%

Thickness 12mm
Thermal conductivity 0.25 W/mK
Compressive strength 6 Mpa

Pregymetal warping consisting of 100/40mm U-shaped guide profiles, 10/10 thickness, 100/50mm C-shaped uprights, 10/10 thickness, back-to-back with 500mm center distance.
Mesh tape or paper for the reinforcement of the internal joints, gypsum-based putty.
25mm nail tip screws placed at a maximum distance of 200mm.
Single-sided adhesive tape in closed-cell polyethylene foam on the entire perimeter of the metal structure in order to eliminate the possible presence of acoustic bridges due to transmissions through building structures.
Double insulating panel in rock wool, density 80 kg/mc, thickness 40+40mm.
Including inspection hatch dimensions 42x60cm (TD02)
Laid at a height set in the project drawings, H 290cm from the walking surface, to be checked on site.

The price includes and compensates the charges for the substructure and accessories for fastenings, cutting and scrap, corner guards, charges for the REI closure of plant penetrations of any type and nature, charges for certifications, technical documentation and forms necessary for the issue of the Fire Prevention Certificate for the protection of R60 structural elements, the formation and unraveling of internal work surfaces, as well as compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

19.12. CE05 – Kingspan Tate Strut Type Structural Metal Ceiling

Supply and installation, in the areas established by the project, of Kingspan Tate Strut type metal false ceiling, designed for Data Centers, having the following characteristics:
- distance between hangers: 1200×600mm with TATE STRUT profiles;
- metal panels of the same size, 1.2cm thick.

Laid at a height established in the project drawings, to be verified on site.
Price includes extrusions, connectors, turnbuckles and threaded starter rod, bolts and washers, and any other items identified in the optional materials.
Installation: Follow Kingspan Tate installation guidelines.

The creation of holes for the insertion of any lighting fixtures or plant elements are included and compensated; any specific solutions at the structural joints, the formation and unraveling of the work surfaces, as well as compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

19.13. TD01 - False ceiling inspection hatches

Construction of inspection hatches inside suspended false ceilings in flat plasterboard sheets, complete with galvanized steel frame both for the fixed part screwed to the false ceiling frame, and

for the door that can be opened outwards with a snap lock and Push Pull release, cover with plasterboard sheet with a type like that of the false ceiling where installed, according to UNI EN 520 - DIN 18180, features:
- thickness of the slab: 12.5mm,
- reaction to fire class: A2-s1, d0,
- Push closure system on zipper.
- Trapdoor dimensions: 60x60cm, to be verified with the system project.

The formation of the ceiling opening and support structure is included, all certified and compliant. The price includes and compensates for the costs for cutting, scrap, also due to the irregularity of the compartments, compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

20. PLASTERS

20.1. Generality

Weather conditions

It will not be possible to proceed with the execution of plasters, in particular external ones, when the structures are not protected from atmospheric agents, i.e. when there is the possibility that rainwater can soak the surfaces to be plastered and not even when the minimum temperature in 24 hours is such as to affect the good grip of the mortar. According to the provisions of the Works Management, this limitation may be waived in the case of internal plastering carried out in temporarily closed rooms equipped with adequate heat sources.

TYPES OF PLASTER

a) Rough plaster or curling

Once the vertical bands have been prepared, under a guide rule, in sufficient number, a first layer of mortar called rinzaffo will be applied to the walls, cast forcefully so that it can penetrate the joints and fill them. After this layer is somewhat dry, a second layer of the same mortar will be applied to it, which will be spread with a trowel or trowel, filling every crack and removing all harshness, so that the walls will be regular, as far as possible.
This layer forms the base of the civil plaster and ceramic coating.

b) Common or civil plaster (stabilization)

As soon as the rough plaster has taken consistency, a third layer of fine mortar will be spread over it which will be balanced with the guide faces so that the entire surface is flat and uniform, without swaying and arranged in a perfect vertical plane.
This plaster will be carried out on the internal and external surfaces of the buildings.

c) Plaster with premixed mortar

For the execution of the plaster with premixed mortar, the Contractor must prepare the points, the guide strips and the application of the mortars, as previously prescribed in the point relating to rustic rough plaster.
A final layer of skimming must be applied to this base plaster with mortar of the same quality as the substrate, but with finer aggregates; The mortar must be spread, smoothed and finished with a trowel or metal spatula.

d) Decorative plaster

It will be made in imitation of the existing decorative plasters which, due to their poor state of preservation, will have to be demolished. The decorative plaster will be carried out with mortars and thicknesses similar to the existing one.
To make anchoring to the masonry more effective, decorative plasters can be applied to a special plaster mesh.

e) Dehumidifying plaster

The dehumidifying plaster will be carried out at the base of the perimeter load-bearing walls of basement rooms with the aim of drying up the moisture present.

For this purpose, special pre-packaged dehumidifying mortars or special additives will be used to be mixed with normal civil plaster.
In any case, the dough must have a high power of breathability and diffusion.
If the presence of salts is detected on the masonry substrate, these must be neutralized with the application of a special primer compatible with the plaster.
The entire plaster construction procedure must be carried out in full compliance with the constraints, prescriptions, and times, established by the manufacturing companies.

f) Sound-absorbing plaster
Special vermiculite-based plasters and inorganic binders without asbestos or other fibers will be used.
This plaster will be applied by spray after applying a layer of rough plaster.
The plaster will be painted with a special colored paste finish.

g) Plasters mixed with water-repellents
Plasters mixed with water-repellent must be carried out using the same criteria described in the previous paragraphs.

h) Fireproof plasters
These plasters, to be made in order to obtain a fire-resistant coating, will consist of premixed gypsum-based plasters, expanded vermiculite and inorganic binders, to be applied by spray in one or more passes depending on the thicknesses necessary to guarantee the required fire resistance class.

20.2. Methods of execution and types of mortars to be used

Civil plaster for interiors
The plaster will consist of a rustic scratch coat of bastard mortar of hydraulic lime and cement 1.5 cm thick and a curl of fine cement mortar 0.5 cm thick, sieved, pulled with a fine trowel.
The mortars to be used must be premixed of standard industrial production or with the following compositions.
Mortar for rustic rinzaffo:
Cement type R325 2.5 ql
Eminently hydraulic lime 1 ql
Screened live sand 1 mc
Mortar for curling:
Cement type R325 4 ql
Fine river sand 1 mc.

Coloured mineral plaster (finish for exteriors and internal parts to be sampled by the D.L.)
Intended use: horizontal and vertical surfaces of any height, including bastard mortar base plaster applied with the provision of guides on hot-dip galvanized steel wire plaster mesh and the necessary scaffolding.
Material characteristics
Bastard mortar of lime, sand and cement for the base plaster.
Plaster based on lime, cement, selected sands, inorganic pigments and specific additives.
Features:

Powder density	1.4 kg/lt
adhesion to concrete	> 0.3 MPa
adhesion on seasoned plaster	> 0.4 MPa
Minimum fine grain thickness	2 mm
Minimum thickness medium grain	4 mm
Fine grain size max	0.6 mm
average max grain size	1.2 mm

Method of installation

The hot-dip galvanized steel wire plaster mesh will be glued to the wall structure by means of guns in an adequate number to ensure the solidity of the support; you must make sure that the mesh adheres completely to the surface to be plastered.

The bastard mortar base plaster will then be applied, which must penetrate well into the mesh of the mesh. The base plaster must be finely troweled and must have a thickness of 2.5 cm for the external surfaces and 1.5 cm for the internal surfaces in contact with the exterior, according to design and/or Works Management indications regarding location.

The mineral plaster to be used must be the fine-grained or medium-grained type according to the indications of the Works Management.

The substrate must not be subject to movement and contraction, it must be homogeneous and well seasoned. Its application must be carried out in two layers: the first layer, protection and saturation, will be applied with a stainless steel spatula and will have the thickness necessary for finishing; The second layer, of finish, must be applied at least 12 hours later with the same spatula.

Then it will have to be finished according to the type of finish required:

Trowel: finishing with a sponge trowel;

talocciata: finish with wood or plastic talocgia.

The average thickness of the mineral plaster must not be less than 4/5 mm.

Applications

Since the product is sensitive to the action of the sun and wind, the mineral plaster must not be carried out with strong wind or with temperatures below +5° C or above +35° C.

For mixing the product, mechanical mixing is recommended for about 5 minutes.

On large surfaces, it is advisable to interrupt near joints and downpipes.

The same amount of water must be used for each dough to avoid color variations.

The colour, the type of grain and the type of finish will be chosen from time to time by the Works Management on an appropriate number of samples.

Skimming of concrete surfaces, horizontal and vertical interiors with cementitious skim coat, carried out at any height.

Destination: technical or similar premises not open to the public.

Material characteristics

Mixture based on lime, cement, selected aggregates, and specific additives. Features:

own weight	1.8 kg/lt
adhesion to concrete	0.6 MPa
Minimum thickness	2 mm
Maximum thickness per coat	10 mm
grain size	< 0.6 mm

Method and installation

The concrete supports must be stable, cleaned with a water wash until dust, efflorescence and release residues are completely eliminated.
Cementitious skim coat will be applied to the clean and well-wet substrate. The application will be carried out with a metal trowel in two passes of adequate thickness (greater than 2 mm and less than 10 mm) to the total thickness provided for in the notebook of types of masonry. Between the first and second coats the waiting time will be about 3 - 6 hours.
The finishing will then be carried out in the completed plastic phase (about 20 minutes), rewetting the surface with water and trowel with a sponge trowel until a uniform "civil-fine" appearance is obtained.
Application
Since the product is sensitive to the action of the sun and wind, it is not necessary to shave with strong winds and with temperatures below +5° C or above +35° C.
Treated surfaces that are they will be exposed to full sun.

Rough plaster
Scratch coat
The rough plaster will be carried out by applying a first layer of mortar, about 0.5 cm thick, obtained with rather coarse-grained sand, cast forcefully so that it can penetrate the joints and fill them.
On the surface to be plastered, some points have been fixed, called cornerstones (or posts), and appropriate bands, called sixths (or rulers), will be prepared between them, made under guide rules, and at a sufficiently close distance. This operation will be called "sestiato".
Crossing
When the mortar of the scratch coat has made a slight set, a second layer of the corresponding mortar for finishes will be applied to it (in the case of external plasters the traverse will normally be made of cement or hydraulic bastard mortar), in order to obtain a flat surface that is not very smooth, as a guide you will use the sixths or rulers, according to the straight lines of the plane, removing the excess mortar with a wooden ruler and equalizing the missing parts in order to ultimately have a single plane of sufficient regularity (traversed).

Common plaster
As soon as the rough plaster has taken consistency, a further layer (monachino) of the corresponding plaster mortar must be applied through a fine sieve, which will be balanced in such a way that the entire surface is perfectly uniform, flat, or according to the particular shapes established.
The layer of monachino will normally be worked with a trowel, covered or not with felt cloth, according to prescriptions.

Stucco plaster
Simple stucco plaster
Two layers will be superimposed on the rough plaster, the first of which is 2.5 mm thick and the second about 1.5 mm, formed respectively with normal mortar for stucco and with stucco glue.
The surface must be carefully smoothed with a steel trowel so as to have perfectly flat walls free from any imperfection.
If the grout should become colored, the colors chosen by the Works Management will be diluted in the mortar.

Glossy stucco plaster

It will be prepared with the same procedure as simple putty.

Once the stucco has been flattened, before it is dry, the surface will be wet with water in which Marseille-type soap has been dissolved, then it will be compressed and polished with hot irons, avoiding any stain which will always be attributed to poor execution of the work.

Once the operation is complete, wet the putty with the same soapy solution, smoothing it with a cloth.

Gypsum plaster

The surfaces on which gypsum plaster will be applied must be free from dust, efflorescence, traces of grease and the like; they must also have sufficient roughness to ensure the adhesion of the plaster.

The same surfaces must be previously wetted, in order to avoid the absorption of the water from the mortar mixture.

If the plaster is to be applied in several layers, the previous layer must be roughened before applying the next.

Plaster with gypsum-only mortar

The gypsum mortar must be prepared in wooden, galvanized steel or plastic containers, previously washed, in sufficient quantity for immediate use, having to apply only the mixture in the plastic state and discard what has set before installation.

The mixture will be made by pouring water into the container first and then chalk until it emerges, then mixing with the right degree of plasticity.

It will be forbidden to mix the products of one wet with those of the next.

The mortar will be applied directly to the masonry in sufficient quantity and pressure to obtain good adhesion of the same.

After spreading the mortar on the masonry, it will be smoothed with metal spatulas to obtain the necessary finish.

Any skimming will also be carried out with plaster mixture.

Plaster with gypsum mortar and sand

It will be formed as in the previous point, but with mortar whose solid components will be made up of gypsum and finely screened sand, in the weight ratio 1:2.5.

The thickness rendered by the plaster must not be less than 10 mm at any point.

Skimming will always be done with chalk mixture only.

Plaster with gypsum mortar, lime and sand

It will be formed as in the previous point, but with mortar whose solid components will consist of gypsum, powdered hydrated lime and finely screened sand, in the ratio of 1:1.1.

To the mixture, which will normally be industrially pre-packaged, intake regulator additives will be added in adequate quantities (on average 50 ÷ to 100 kg per tonne of mixture).

The thickness of the plaster must be not less than 10 mm.

Skimming will always be done with chalk mixture only.

Plaster with gypsum mortar and light aggregates

It will be formed as in the previous point but with mortar whose solid components will consist of gypsum and light aggregates of medium grain (maximum size not exceeding 6 mm) in the ratio of

at least 600 kg of gypsum per cubic meter inert. The thickness of the plaster must be not less than 10 mm, skimming will always be carried out with a mixture of plaster only.
Finishing with plaster only
If the finish in question is carried out on plaster not consisting only of gypsum, the thickness must not be less than 3 mm; The dough must be smoothed with suitable spatulas or metal trowels.

Exterior decorative plaster
The generic term decorative plasters refers to all those works necessary for the complete covering of the external walls of buildings, of the plinths of attics, generally carried out with mixtures of mortars of various types and sand or marble powder, grit, etc., with or without the addition of coloring materials.
They also include special plasters, whether or not pre-packaged in the factory.
All the aforementioned plasters will always be made, like the civil plaster referred to in the previous point, of a layer of rough or body (scratching + crossing or squaring or possible curling), with a thickness of 3 ÷ to 8 mm depending on the type and process.
The scratch coat will normally consist of cement mortar dosed at 400 ÷ 500 kg of cement and coarse-grained silica sand.
The squaring and curling will be given with cementitious bastard mortar, common or hydraulic, in the types prescribed by the Works Management.
The mortar to be used must always contain a water-repellent of excellent quality and of sure effectiveness, in the optimal proportions established by the manufacturing companies.
For the formulation of protruding parts such as plinths, bands, pilasters, squares, etc., the Contractor will be obliged to prepare the relative frameworks during the execution of the masonry works.

Cement plaster
The cement plaster will be carried out in accordance with the provisions of the previous point with the specification that the layers following the scratch coat will be used only cementitious mortar in the types for finishes and plasters (respectively dosed at 500 and 600 kg of cement).
The last layer of fine mortar glue, possibly colored, must be pulled and smoothed in perfect flatness, with a special tool, or trowed according to prescription.
The protection specifications previously listed for conglomerates apply to the plaster in question; The common plaster must be kept moist and protected from solar radiation for at least 15 days after execution.

Cement plaster and grit
It will be carried out on cement mortar scratch coat with a mixture of 400 ÷ 450 kg of cement (normal, white or colored), 0.8 m3 of particularly selected sand and 0.4 m3 of marble grit of quality, size and colors that will be indicated by the Works Management.
The visible surface will be worked in bands, ashlars, squares, etc., according to the drawings and then subjected to one of the following treatments:
Brushing: it will be carried out with metal brushes or stiff bristles, with a discreet jet of water, to remove the removed material and clean any area of inert materials in sight. The period of time in which the treatment can be carried out will be between two or six hours after the coating has been applied and in any case, for normal weather conditions (temperature between 12.8° and 18.3°C), it must not exceed 16 hours.

Hammering: it will be carried out with a pneumatic hammer and tools of various types (pointed, comb, multi-headed, etc.) taking care of the uniformity and regularity of the processing with the utmost attention.
Particular care will be required in the treatment of the edges, which can be ordered smooth or worked with a flat chisel.
Hammering must be carried out no earlier than 30 days after the coating has been applied.
Abrasive sandblasting: it will be with a pressurized jet of sand and compressed air directed on the surface to be treated, keeping the inflow nozzle about 30 cm from the surface itself. The rhythm and depth of abrasion will be related to the type of aggregates and the decorative effects to be created.

Plastic plaster
Normally produced industrially and supplied ready in sealed packages, the plastic plaster will be composed of synthetic resins (in aqueous emulsion or solvent), aggregates, pigments and various additives (amalgamants, stabilizers, fungicides, bactericides, water-repellents, etc.) in such ratios as to create, in application and in the expected thickness, a coating that responds, in whole or in part (as required by the Works Management), the test characteristics reported in these Specifications.
The plaster must have high requirements of adhesion, resistance and, if in particular or external applications, also in water repellency.
The support or base will normally consist of the layer of plasterboard, in bastard mortar if for exteriors, perfectly seasoned or free from humidity.
On this plaster pad and in the cases provided for by the plaster manufacturers, one or more coats of special preparation products must be applied with a brush.
How to apply
The application of plastic plaster must be preceded by the protection, with self-adhesive paper tapes, of the walls not to be plastered (marble, fixtures, etc.) or prepared for the formation of brushstrokes in the prescribed sizes and shapes.
The adhesive paper must be removed before the plaster hardens, taking care of the perfect finish of the edges.
The application of plaster will vary in relation to the types and surface finishes (smooth, striped, scratched, rustic, troweled, rolled, sprayed, etc.).
Normally, however, the paste, after vigorous mixing in a plastic tray, will be spread on the wall to be plastered with the metal trowel, from the bottom up, with a thickness of about 3 mm.
The application will then be adjusted with the metal trowel, with vertical and horizontal movements, in order to avoid undulations.
Subsequently, with the same perfectly washed and dry trowel, the surface must be lammed forcefully, in order to compress the granules and obtain a uniform and regular surface.
Once the work is completed, the covered surfaces must be fully compliant with the samples previously prepared by the Contractor, subjected to testing and accepted by the Works Management.

For LEED certification, Material Information Sheets must be produced, they are required for all relevant products, including adhesives, sealants, carpets, paints and plasters. The Material Information Sheet must indicate the Volatile Organic Compounds (VOC) limit value of the product (If the Information Sheet does not contain VOC limit values, these must be provided with additional documentation, such as product sheets, publications or certification letters from the manufacturer).

20.3. Reference legislation

- UNI EN 196/1:2016: Test methods for cements – Part 1: Determination of mechanical strengths.
- UNI EN 1062-11:2003: Paints and varnishes - Products and painting cycles of external masonry and concrete works - Conditioning methods before tests
- UNI EN ISO 7783:2019: Paints and varnishes. Determination of Water Vapor Transmission Properties – Capsule Method
- UNI EN 413-2:2016: Masonry cement – Part 2: Test methods
- UNI EN 459-1:2015: Construction lime – Part 1: Definitions, specifications and conformity criteria.
- UNI EN 12390-4:2019: Tests on hardened concrete – Part 4: Compressive strength – Specifications for testing machines
- UNI EN 12390-13:2021: Test on hardened concrete – Part 13: Determination of the secant modulus of elasticity in compression
- UNI EN 1015-7:2000: Test methods for masonry mortars - Determination of the air content of fresh mortar
- UNI 8147:2017: Non-metallic expansive agents for cementitious mixtures. Determination of the contrasted expansion of the mortar
- UNI 8298-1:2022: Resin systems for horizontal and vertical surfaces – Part 1: Determination of the adhesion of the resin system to the substrate
- UNI 8752:1985: Construction. Painting, varnishing, RPAC, painting, surface impregnation. Classification, terminology and functional layers.
- UNI 7044:1972: Determination of the consistency of cement mortars by the use of shock boards
- UNI EN 16025-1:2013 Thermal and/or acoustic insulation for the construction of buildings – Premixed mortars lightened with EPS – Part 1: requirements for premixed mortars containing EPS beads
- UNI EN 16025-2:2013 Thermal and/or acoustic insulation for the construction of buildings – Premixed mortars lightened with EPS – Part 2: Manufacture of pre-mixed mortars containing EPS beads
- UNI 9728:1990: Protective products for coatings consisting of stone and plaster. Criteria for technical information.
- UNI 10764:1999: Hydraulic binders for microphones. Definitions and requirements.
- Ministerial Decree 03/06/1968 Minimum flexural strength
- R.D. 2231/39 Requirements on kicks
- L.595/65 – D.M.31/08/1972 Technical characteristics and requirements of hydraulic binders

- Circ. Min. 1796/64 of the Ministry of Public Works
- Circ. Min. 3150/67 of the Ministry of Public Works

Plastering must generally be carried out in the appropriate season, after removing the poorly adhering mortar from the joints of the walls, and after cleaning and abundantly wetting the surface of the wall itself.
Plasters of any kind: smooth, rustic surface, ashlars, for frames and anything else must never have hairs, cracks, irregularities in alignments and edges, or other defects.
The edges of the masonry will be protected with special galvanized steel profiles to be fixed by means of anchors and cement mortar.
Those that are in any case defective or that do not have the necessary adherence to the masonry, must be demolished and redone by the Contractor at his expense.
When the work is finished, the external plaster must have a thickness of not less than mm. 15.
The protruding or retracting edges will be made at a sharp angle or with appropriate rounding according to the orders given in this regard by the Works Management.
In particular, for each type of plaster, the following is prescribed:

20.4. Acceptance Requirements

For each batch of materials that he will use in the preparation of the products, the Contractor must provide the Works Management with the relative certificate of origin with the result of the tests to which they have been subjected in the factory or at Official Laboratories.
It is prescribed that all materials must correspond in characteristics to the provisions of the official rules and regulations in force on the subject.
The Works Management and the Inspector reserve the right to have samples taken of materials to be subjected to all the tests that he deems appropriate, based on the regulations, to ascertain the quality of the materials, as well as tests during the works, on the materials put and to be installed, to ascertain their compliance with the sample materials.
During testing, the materials used will be compared with those of the sampling.
The costs relating to the execution of the above tests will be borne by the Contractor.

20.5. Performance Specifications

Charges and obligations of the Contractor
All the services listed in the contractual documents to give the works completed as specified in this specification.
Before the start of the installation of the materials, it will be the responsibility of the Contractor to verify that the environmental conditions of the construction site, with regard to internal humidity, the presence of water or dust, do not represent a risk of degradation of the material and finishes, and to check the structures on which the finishes will have to be carried out. This inspection must be carried out promptly so that any necessary restoration work can be carried out in time to comply with the work schedule.
Supply of materials, unless otherwise decided at the time of ordering.
Transport, unloading, storage, protection and custody of materials in environments prepared by the Contractor.
Various transport equipment from the warehouse to the place of use.
Equipment, specialized and ordinary labor for the installation of materials.

Rooms suitable for: shelter, changing room, refectory, etc. for the Contractor's staff, as required by current health and safety regulations in the workplace.
Power and water lines from existing on-site gripping points to user tools.
The scaffolding necessary for the execution of the works, carried out in the strictest compliance with accident prevention regulations
The maintenance in perfect efficiency of provisional works and signage and all those services and accessories for the protection of people, things and finished work from any type of damage.
Cleaning and all the necessary protections to avoid any and all damage to the finished works.
The restoration of any works damaged during the installation of materials.
The transport from the places of installation and the stacking within the construction site, in a fenced area, previously indicated by the Works Management, of the waste and waste materials. The transport of the same to the disposal sites, including all related charges and practices.
The cleaning of the areas used for the stacking of materials and waste.
The products used for the pigmentation of plasters must be supplied by qualified companies in the sector and be accompanied by technical data sheets with all the information relating to the characteristics and methods of use.
Particular care must be taken in describing the following characteristics of each product:
PRODUCT
BRAND
PRODUCTION DATE AND EXPIRATION DATE
MANUFACTURER'S CODE
CORRESPONDING RAL CODE
COMPOSITION RECIPE
METHODS OF DILUTION, USE, DRYING
ANYTHING ELSE NECESSARY FOR AN UNAMBIGUOUS IDENTIFICATION OF THE PRODUCT
At the end of the works, among the indispensable requirements for the final testing, the Contractor must provide (in the number of copies required by the Works Management or the Tester) a file that collects the above data. One of the same files will be attached to the spare materials.
Stocks
For each type of pigmentation material used in the colouring of the plasters, the Contractor must deliver to the Client a quantity to be kept in stock to be used as a possible touch-up equal to 2% of the material, but in any case sufficient to produce at least 25 square metres of colour per type.
Stocks will be delivered to the shipyard fully packed with the wording "SPARE MATERIALS".
These batches of material must be perfectly identical to those installed.
It is imperative that a copy of the file is deposited as an attachment to the stocks with the cards showing the characteristics described in order to be able to easily reproduce the colors for future retouching or remaking cycles.

20.6. Sampling/testing methods

Relating to individual components
The Contractor must submit for approval a double series of samples of the ready-mixed plasters and the materials he intends to use, and of finished plasters, laid on boards of homogeneous stabilized material of medium density (MDF), and on site, of such dimensions as to be able to judge the overall work in locations to be defined in agreement with the Works Management.

The materials must be accompanied by the original packaging of the Manufacturer, labeled and countersigned, and will remain on site for comparison with the various supply lots.
These samples must be approved by the Works Management and countersigned by the parties: one series will be kept by the Contractor and one series by the Client.
Without the written approval of the sampling, by the Works Management, the installation cannot begin.
The constancy of the qualitative and aesthetic characteristics of the plasters must be guaranteed throughout the supply, both in terms of the constituent materials and in terms of the specific application methods.
The Works Management reserves the right not to accept material that does not correspond to the requirements and does not comply with the sampling.
The approval of the samples by the Works Management does not relieve the Contractor of his responsibilities, as the acceptance of the supply by the Works Management is subject exclusively to the achievement of the final requirements of the work.
For each batch of material supplied, certificates relating to any tests that will be carried out on samples taken from the same batch of material that will be used for the construction of the plasters may be requested.

Relating to components and systems in place
Where required by the project or by the Works Management, the approval of the samples referred to in the previous paragraph is in any case subject to the simultaneous approval of the components and systems made on site in order to assess the suitability and relationship between them.

20.7. Tests

The following tests will be carried out:
Provisional testing
The correspondence of the works carried out to the project and the correspondence of the materials used to those provided for in this technical specification will be ascertained.
It will consist of verifying the correctness of the installation, the surface layer, the uniformity of color, the horizontality and verticality of the planes, the respect of any slopes, the coplanarity.
The plastered surfaces, both horizontal and vertical, will be checked by means of a 2.50 m long ruler. Surfaces that have undulations on the length of the ruler that give deviations of more than 2 mm will not be accepted.
During this phase of testing, the Works Management will be able to ascertain the adherence to the masonry both with tear tests and with the taking of samples to be subjected to physical tests or laboratory analysis with a maximum of one series of tests every 500 square meters.
Plasters, of any type, must never have hairs, cracks, irregularities in alignments and edges or other defects.
The removal operations, the subsequent restoration of the surface and the burden of tests and analyses will be borne by the Contractor. Backgrounds that present imperfections and irregularities due to defects in the materials or installation must be restored entirely, by and at the expense of the Contractor.
Final testing

It will consist of verifying that any requirements made during the provisional testing have been complied with and that the works do not show any sign of degradation.

20.8. VF05 - Gypsum skimming of horizontal and vertical surfaces – STAIRWELL

Skimming of plasterboard/masonry walls/cladding and stairwell floors and, as indicated in the project drawings, before proceeding with the painting, by application with a smooth metal trowel, of a premixed one-component grey or white skim coat with normal hardening, based on aerial and hydraulic binders, selected fine-grained limestone sands, special additives and synthetic polymer powders, such as Planitop 560 by Mapei.
Mixed with water on site and applied to a minimum thickness of 3 mm per coat on perfectly clean, solid and dust-free surfaces, previously prepared by removing any inconsistent parts that prevent the skim coat from being applied correctly and possibly treated with synthetic resin-based primers in water dispersion with a very low content of volatile organic compounds (VOCs) such as Mapei Primer G.
It is advisable to proceed with a careful preparation of the substrate by removing any old paints, inconsistent parts and parts in the process of detachment that may prevent the correct adhesion of the product.
Spread the product on the surface with a flat metal spatula, with horizontal and vertical passages. Smooth to a maximum thickness of 3mm, taking care to completely cover the substrate. Particular care must be taken in the presence of corners and edges; A larger quantity of product is recommended to be applied to these elements and shaped with suitable equipment.
White colour, approximate volumetric mass: 800 kg/mc. Application thickness 3 mm.
Water vapour resistance coefficient (μ): 10 according to EN 1015-19.
Reaction to fire: Euroclass A1 according to EN 13501-1.

The price includes and compensates for the costs for the preparation of the support, the protection of the floors with nylon sheets, the formation and disintegration of the internal work surfaces, the necessary scaffolding for heights up to 6 meters from the work surface; the removal of the resulting material at the end of the work, the separate collection of the resulting material, the transfer with transport to an authorized landfill of the resulting material, the landfill indemnity, compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

21. WORKS BY PLASTERBOARD MAKER

21.1. Generality

This technical specification defines the methods for the supply and installation of:
Plasterboard walls
Plasterboard false walls
Self-supporting partitions

Charges and obligations of the Contractor
All the services listed in the contractual documents to give the completed works as specified in this specification, in particular the following.
Before the start of the installation of the materials, it will be the responsibility of the Contractor to verify that the environmental conditions of the construction site, with regard to internal humidity, the presence of water or dust, do not represent a risk of degradation of the material and finishes.
This inspection must be carried out promptly so that any necessary restoration work can be carried out in time to comply with the work schedule.
Supply of materials, unless otherwise decided at the time of ordering.
Transport, unloading, storage, protection and custody of materials in environments prepared by the Contractor.
Various transport equipment from the warehouse to the place of use.
Equipment, specialized and ordinary labor for the installation of materials.
Rooms suitable for: shelter, changing room, refectory, etc. for the Contractor's staff, as required by current health and safety regulations in the workplace.
Power and water lines from existing on-site gripping points to user tools.
The tracing operations starting from the cornerstones that will be indicated by the Works Management.
The frames for fixing doors and/or visual frames, the reinforcements of the structure in the areas affected by loads.
The sealing with suitable materials of the joints between the plasterboard sheets and the seals against the masonry structures.
Cleaning and all the necessary protections to avoid any and all damage to the finished works.
The restoration of any works damaged during the laying of materials for entire fields.
The transport from the places of installation and the stacking within the construction site, in a fenced area, previously indicated by the Works Management, of the waste and waste materials.
The transport of the same to the disposal sites, including all related charges and practices.
The cleaning of the areas used for the stacking of materials and waste.

Handling and storage
The slabs supplied in stacks must be arranged, both for storage and transport, in a flat, dry and covered place, for a maximum number of stacks to be deduced according to the technical specifications of the supplier companies.
If a complementary case is required, for greater protection of the batteries, it can be supplied on request without allowing prolonged outdoor storage.
The handling of the individual slabs must be carried out by cutting.

Drawings, technical sheets, certificates

Before the start of the works, the Contractor must provide the sheets, technical bulletins and certificates relating to the individual products or products that he intends to use and obtain the approval of the Works Management.

The Contractor must draw up and submit the workshop, construction and installation drawings to the Works Management for approval, before any work begins.

During the course of the works, the Contractor must update all the drawings according to what has actually been built and deliver them to the Works Management with the maintenance manuals, at the end of the works.

They must clearly indicate all types of artifacts and their position, interference with the electrical system, grids and anemostats, and all construction details such as fasteners, types of anchors, fittings, transoms, joints, any telescopic joints, joint covers, forecasts for expansion and contraction, finishing of exposed walls, closing systems, etc.

The assembly drawings must clearly represent the planimetric and altimetric arrangement of the individual elements with reference to the identification codes of the individual pieces.

21.2. Method of execution

Material characteristics

Produced with gypsum and various additives, in special drying ovens, they must have absolutely constant thickness and dimensions (tolerance ± 0.4 mm) parallel and smooth faces.

They will also have a sound insulation power of not less than 30 decibels (for a thickness of 8 cm and frequencies between 100 ÷ 500 Hz) and thermal insulation characterized by a conductivity of no more than 0.25 Kcal/mh°C.

Sheets consisting of a gypsum core reinforced on both sides with special cardboard with high mechanical resistance.

Features:

- thicknesses: from 9.5mm to 20.00 mm
- Weight: 12 kg/sqm approx.
- dimensions: 120 x 200/350 cm approx.
- useful thermal resistance: 0.04 m°C/W
- reaction to fire: class 1 non-flammable
- surface hardness: 13mm diameter footprint with a 500 gr steel ball with an energy of 2.5 joules

Where required, the slab must be equipped and installed as follows:

Mineral wool insulation layer density ranging from 18kg/sqm to 70kg/sqm, according to the project requirements.

Miscellaneous materials and accessories (adhesive tape, etc.).

The adhesive used to glue the cardboard to the gypsum sheets must not contain formaldehyde.

Load-bearing structure (single or double) in galvanized steel, consisting of guides and uprights in press-bent "U" profiles and "C" uprights, 0.6mm thick.

Frame assembly

The installation of the double metal structure will include:

Floor and ceiling tracing of the external limits of the wall;

Laying of the frame fixed to the wall by means of gun-nailing, neoprene glue, or expansion plugs after interposition between the structure and the wall of a layer of mineral fibre with a thickness of not less than 2 mm;
Rotation insertion of the vertical section breakers within the frame guides;
Installation of accessories such as: reinforcements, etc.
The profiles of the metal frame must be positioned in such a way as not to interfere with the positioning of the electrical system.

Mounting the panels
The plasterboard sheets will be fixed to the structure by using self-drilling screws with cross impression, flat countersunk head, drill bit.
The length of the self-drilling screws must correspond to the total thickness to be screwed increased by 1 cm for fixing on metal supports and by 2 cm for wooden supports.
The surface treatment of the screws must comply with the UNI EN ISO 9227:2017 standard.
The heads of the self-drilling screws, when screwing is completed, must be below the surface of the slab, without affecting or deteriorating the surface cardboard, so that grouting and skimming can hide them completely.
The installation of the slabs must comply with the following requirements:
The overall height of the slabs must be equal to that of the false wall;
The slabs will be positioned vertically, unless otherwise prescribed;
The joint between the sheets must always fall on the axis of the metal upright;
Fixing with screws will take place in correspondence with the metal profiles, 1 cm from the longitudinal edges and 1.5 cm from the transverse edges;
The distance between the screws will be approx. 30 cm. in the case of a single plate.
The cavity must be completely filled with insulating panels with high soundproofing characteristics.
The Contractor, before completing the wall with the installation of the panels, must have the Works Management verify that the insulation materials have been installed.
The insulation must be carried out with whole sheets. No cut-outs should be used.

Finishes
Joint treatment
In order to be able to proceed with a correct treatment of the joints, the slabs must have thinned longitudinal edges.
The treatment will include the following cycle of interventions:
Mechanical or manual coating of ready-to-use plaster on thinned edges;
Fresh application of reinforcement tape in strong micro-perforated paper ground on the edges and scaled on the axis;
Finishing application of a second layer of plaster until the total thinning of the edges is covered and all the fixing screws are covered at the same time;
In correspondence with the sharp edges, after the first layer of plaster, a reinforced band consisting of rolls of strong paper reinforced with two galvanized steel strips will be applied instead of the reinforced strip;
At the intersection of the joints, the belts must not overlap; one of the two must be interrupted in order not to create an overthickness.

21.3. Reference legislation

- C Corrosion tests in artificial atmospheres – Salt spray tests
- UNI EN ISO 10162:2006 Cold-rolled steel profiles – Technical delivery conditions – Dimensional and cross-sectional tolerances
- UNI EN ISO 1461:2022 Hot-dip galvanizing coatings on ferrous finished products and steel articles – Specifications and test methods
- UNI 8201:1981 Residential construction. Simple interior walls. Soft and hard body impact resistance test.
- UNI 8326:1981 Residential construction. Simple interior walls. Resistance test to suspended loads.
- EN 1363-1:2020 Fire resistance tests – Part 1: General requirements
- UNI 11424:2015 Gypsum – Non-load-bearing construction systems of coated gypsum sheets (plasterboard) on metal frames – Installation
- UNI EN 10346:2015 Continuous hot-dip coated flat steel products for cold forming – Technical supply conditions
- ISO 10140-5:2021 Acoustics – Laboratory measurement of sound insulation of building elements – Part 5: Requirements for test facilities and equipment
- UNI EN ISO 717-2:2021 Acoustics. Evaluation of Sound Insulation in Buildings and Building Elements – Part 2: Impact Sound Insulation
- UNI EN ISO 717-1:2021 Acoustics - Evaluation of sound insulation in buildings and building elements – Part 1: Airborne sound insulation
- UNI EN 13501-1:2019 Fire classification of building products and elements – Part 1: Classification based on the results of reaction to fire tests
- UNI EN 15283-1:2009 Fibre-reinforced gypsum boards – Definitions, requirements and test methods – Part 1: gypsum boards with mesh
- UNI EN 15283-2:2009 Fibre-reinforced gypsum boards – Definitions, requirements and test methods – Part 2: Fibre-reinforced gypsum boards
- UNI EN 520 – Gypsum sheets. Definitions, requirements and test methods
- UNI EN 14190:2014 Secondary transformation products of gypsum slabs – Definitions, requirements and test methods
- UNI EN 13963:2014 Jointing materials for gypsum board – Definitions, requirement and test methods
- UNI EN 14496:2017 Gypsum-based adhesives for thermo/acoustic laminated panels and coated gypsum sheets – Definitions, requirements and test methods

- UNI EN 14566:2009 Mechanical connecting elements for gypsum panel systems – Definitions, requirements and test methods
- UNI EN 14353:2017 Metal profiles for use with gypsum slabs – Definitions, requirements and test methods
- UNI EN 12667:2002 Thermal performance of building materials and products – Determination of thermal resistance by the hot plate method with guard ring and by the thermoflowmeter method – Products with high and medium thermal resistance
- Ministerial Decree 26/06/1984 "Classification of reaction to fire and approval of materials for fire prevention purposes"
- Ministerial Decree 14/01/1985 "Attribution of class 0 to some materials provided for by Annex A1 of the Ministerial Decree 26/06/1984"
- Ministerial Decree 04/02/1985 "Transitional rules on the use of materials classified for reaction to fire"

21.4. Acceptance Requirements

For each batch of materials that it will use in the preparation of the products, the Contractor must provide the Works Management with the relevant certificate of origin valid for one year from the date of issue or from the test certificates issued by official laboratories, in particular for tests relating to dimensional and physical-mechanical characteristics.
The supply must be accompanied by the production mark found on the elements or on the appropriate labeling placed on the packaging.
In particular, the compliance with the design indications of the aspects listed below must be verified, for which the Contractor must provide the relevant certifications.
The Contractor shall provide the following data:
fire behavior class;
fire resistance;
soundproofing power;
sound absorption coefficient;
thermal conductivity;
resistance to operating shocks;
Declaration certifying that the adhesive used for gluing the cardboard on the gypsum sheets does not contain formaldehyde.

21.5. Performance Specifications

Plasterboard sheets
Type A coated gypsum sheets, CE marked in accordance with EN520, 12.5 mm thick in the number of 2 sheets per wall, in fire reaction class A2-s1 d0 (non-flammable), screwed to the metal frame with phosphated self-drilling screws. In humid environments, the slab must be of the "hydroslab" type with water absorption after 2 hours of total immersion < 10% by weight (EN 520 - 5.9.2). In terms of minimum environmental criteria, however, the limits provided for by current legislation with

reference to the various component materials are recalled. Plasterboard sheets, intended for the installation of dry systems, must have a content of at least 5% by weight of recycled and/or recovered materials.
The material to be laid must also comply with the following emission limits (Tg/mc) at 28 days:
Total VOCs 2: 1500
Formaldehyde: <60
Acetaldehyde: <300
Toluene: <450
Tetrachloroethylene: <350
Xylene: <300
1, 2, 4 – Trimethylbenzene: <1500
1, 4 – Dichlorobenzene: <90
Ethylbenzene: <1000
2 – Butoxyethanol: <1500
Styrene: <350

Isolation
Mineral wool insulating panels with performance characteristics specified in the description of the construction system and in the vertical internal partition abacus.
The panels will have a thickness of 40/60/80mm depending on the size of the metal structure of the wall (see abacus vertical internal partitions).

Metal structure
Metal frame made of first choice cold-bent galvanized steel profiles with "U" geometry of 50, 75 and 100 width (guides) and "C" of 50, 75, 100 (uprights) wide, pre-drilled every 50 cm to be laid at a maximum distance of 600 mm (see specifications in the abacus of vertical internal partitions), in class A1 of fire resistance.

21.6. Sampling/testing methods

For each batch of materials that he will use in the preparation of the products, the Contractor must provide the Works Management with the relative certificate of origin with the result of the tests to which they have been subjected in the factory or at Official Laboratories.
It is prescribed that all materials must correspond in characteristics to the provisions of the official rules and regulations in force on the subject.
The Works Supervision and the Inspector reserve the right to have samples taken of materials to be tested according to the regulations.
The costs relating to the execution of the above tests will be borne by the Contractor.

Relating to individual components
The Contractor shall submit for approval a double set of samples of the individual materials it intends to use, of such dimensions as to be able to judge the overall work (and the related certificates as described above).
These samples must be approved by the Works Management in the case of visible materials; these samples must be countersigned by the parties.

One series shall be kept by the Contractor and one series by the Principal.
Without the written approval of the sample by the Works Management, the installation cannot begin.
The Works Manager has the right to request an acceptance check, with the aim of ascertaining whether the elements to be installed have the characteristics declared by the Manufacturer.
For materials supplied on several occasions, samples will be taken from the individual batches and compared with the initial samples to verify their adequacy.
The Works Management and the Tester reserve the right to have samples and samples of materials carried out, as well as for legal checks, also for checks during construction.
The costs relating to the execution of the above tests will be borne by the Contractor.

Relating to components and systems in place
Where required by the project or by the Works Management, the approval of the samples referred to in the previous paragraph is in any case subject to the simultaneous approval of the components and systems made on site in order to assess the suitability and relationship between them.

21.7. Tests

The Works Management reserves the right to have the following checks and tests carried out by its representatives of the supplies covered by the contract in order to ascertain compliance with the required quality requirements.

Provisional testing
The correspondence of the works carried out to the project and the correspondence of the materials used to those provided for in this technical specification will be ascertained.
A verticality and flatness check will be carried out, verifying that along a segment of 3.00 m long there is no deviation of more than 0.5 cm, ensuring in any case the perfect continuity of the facing ready to receive the planned painter's works.
The evaluation index of the acoustic insulation on site will be determined, respectively between adjacent rooms and between corridors in normal operating conditions, without the presence of furniture, with air supply and return vents in normal operating conditions. In particular, the acoustic requirements must still be respected.

Final testing
It will consist of verifying that any requirements made during the provisional testing have been complied with and that the works do not show any degradation.

21.8. Guarantees

The provisions of the General Conditions of Contract, with the following clarifications, apply.
The warranty will be two years from the date of final testing, and must provide for the remaking of paintwork and coatings that may prove to be defective, as well as compensation for any damage.
The above warranty will also include the labor necessary to carry out any repairs or replacements and will cover failures attributable to improper or inadequate preparation of surfaces, inaccurate application procedures, expansion, softening and defective materials. Should repairs or replacements affect premises where production takes place, the warranty will also include compensation for damages relating to the shutdown of the same.

21.9. NIM11 - Reinforcement on plasterboard walls

Construction of structural reinforcement of plasterboard walls subject to heavy loads and the installation of glass movable walls, sized by the Contractor, compliant with safety standards with regard to static loads according to NTC 2018, and compliant with Anti-seismic and Fire Prevention standards, through the insertion in the cavity of mullion and transom profiles, fixed to the primary structure of the wall with suitable dowels.
The costs are included and compensated, the sizing and static verification for the loads established in the project, to be submitted to the approval of the D.L., the fastening system, compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

21.10. DW01 – EI60 internal partition wall, 21cm thick – DATA HALL

Supply and installation of an internal plasterboard partition wall, EI60 certified by means of a classification report carried out by a Qualified Laboratory, according to EN 1363-1 EN 1364-1 standards, with a total thickness of 21cm, development from slab to slab overall height H max = 7.50 meters, composed as follows:
- double sheet in reinforced plasterboard GKF, th. 15mm
- single self-supporting metal frame, th. 150mm
- double insulating layer in glass wool, th. 40+100mm
- double sheet in reinforced plasterboard GKF, th. 15mm

Structural reinforcement with 150x70mm box profiles is planned every 4 meters.

The self-supporting metal frame with slab to slab development, made with Knauf "E" series profiles in galvanized steel DX51D+ZN- A-C 0.6mm thick in accordance with EN 14195 and UNI EN 10346, with 1st choice zinc coating and Zn 99% quality, CE marked, consisting of guides at the base "U" 40/150/40mm, th. 0.6mm; "C" uprights 50/150/50mm th. 0.6mm, inserted in the guides, placed at a distance of 400mm and insulated from the perimeter structures with Knauf single-sided adhesive vinyl tape with acoustic cutting function, 3.5mm thick and sealed with putty and/or silicone to completely fill the cracks at the perimeter joints with the primary structures, to achieve the required acoustic performance.
The guides will be constrained to the slab at the base and at the top by means of dowels suitable for the support placed at a distance of no more than 600mm.
The profiles will comply with the harmonized standard EN 14195 concerning "Profiles for Coated Gypsum Sheet Systems" with CE certificate of conformity, in class A1 of reaction to fire, produced according to the UNI-EN-ISO 9001-2000 quality system, with production certified by ICMQ

Filling of the cavity of the metal frame with a double panel type KNAUF INSULATION MINERAL WOOL 35 (λD 0.035 W/mK): glass mineral wool panel without coating suitable for thermal and acoustic insulation of partition walls, false walls.
The insulating panels will be inserted under pressure and continuously in the space between the uprights, laid at staggered joints, well placed together, taking care that they are not in any way compressed between the plasterboard sheets, but have an adequate thickness according to the air

gap; provide for any fixing of the same to the uprights of the structure to ensure that the insulating panel remains in place.

The coating of the metal frame will consist as follows:
Double sheet on both sides of the Knauf GKF type plasterboard frame, controlled density sheets, reinforced with mineral fibers and additives to increase the resistance to cohesion of the gypsum core if attacked by fire, having the following technical characteristics:

- Slab thickness 15mm
- Fire reaction class: A2-s1, d0 (B)
- Density: 820 kg/m3 approx.
- Thermal conductivity λ: 0.20 – 0.23 W/mK
- Water vapour permeability (EN 10465-2008): 10 dry – 4 wet
- Tested from a bio-housing point of view according to the certificate issued by the Institute of Bioarchitecture in Rosenheim

The slabs will be screwed with phosphated self-drilling screws with flat countersunk head, laid at staggered joints and with a distance of no more than 600mm for the first layer and no more than 250mm for the second layer.
The slabs will be laid in accordance with the procedures prescribed in the UNI 11424:2015 standard and subsequent amendments and additions.
The on-site supply will include the grouting of the joints, corners and screw heads as well as the grouting and sealing of the joints where the slabs are approached, carried out with suitable stucco after applying strips of support reinforced with textile mesh, the subsequent grouting of the surface of the slabs in order to obtain a surface ready for the finish chosen in the project.

The price includes and compensates for the costs for cutting and scraping, corner guards, the formation of door compartments complete with perimeter reinforcement in metal profiles for anchoring the window, the cost of proceeding after the application of the slab while waiting for the execution of electrical and thermo-hydraulic systems to be inserted, the cost for sealing EI between wall and slab with solutions suitable for guaranteeing fire resistance, the charges for the REI closure of plant penetrations of any type and nature, the charges for certifications, technical documentation and forms necessary for the issue of the EI60 Fire Prevention Certificate for dry walls, the formation and dismantling of internal worktops, as well as compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and what other necessary to give the finished work in a workmanlike manner.

21.11. DW02 – Insulated internal wall, 15cm thick, partition between wet and standard environment, EI60 certified

Supply and installation of an internal plasterboard wall type Knauf W112, with a total thickness of 15cm, partition between the humid environment and the standard environment, EI60 certified by means of a classification report carried out by a Qualified Laboratory, according to EN 1363-1 EN

1364-1 standards, development from slab to floor overall height H max = 7.50 meters, composed as follows:
- external sheet in water-repellent plasterboard GKI, th. 12.5mm
- GKB standard plasterboard internal sheet, th. 12.5mm
- single self-supporting metal frame, th. 100mm
- insulating layer in glass wool, th. 40+50mm
- double sheet in standard GKB plasterboard, th. 12.5mm

The self-supporting metal frame with development from floor to slab, made with Knauf "E" series profiles in galvanized steel DX51D+ZN- A-C thickness 0.6mm in accordance with EN 14195 and UNI EN 10346, with 1st choice zinc coating and 99% Zn quality, CE marked, consisting of guides at the base "U" 40/100/40mm, th. 0.6mm; "C" uprights 50/100/50mm th. 0.6mm, inserted in the guides, placed at a distance of 400mm and insulated from the perimeter structures with Knauf single-sided adhesive vinyl tape with acoustic cutting function, 3.5mm thick and sealed with putty and/or silicone to completely fill the cracks at the perimeter joints with the primary structures, to achieve the required acoustic performance.
The guides will be constrained to the slab at the base and at the top by means of dowels suitable for the support placed at a distance of no more than 600mm.
The profiles will comply with the harmonized standard EN 14195 concerning "Profiles for Coated Gypsum Sheet Systems" with CE certificate of conformity, in class A1 of reaction to fire, produced according to the UNI-EN-ISO 9001-2000 quality system, with production certified by ICMQ

Filling of the cavity of the metal frame with a double panel type KNAUF INSULATION MINERAL WOOL 35 (λD 0.035 W/mK): glass mineral wool panel without coating suitable for thermal and acoustic insulation of partition walls, false walls.
The insulating panels will be inserted under pressure and continuously in the space between the uprights, laid at staggered joints, well placed together, taking care that they are not in any way compressed between the plasterboard sheets, but have an adequate thickness according to the air gap; provide for any fixing of the same to the uprights of the structure to ensure that the insulating panel remains in place.

<u>The coating of the metal frame will consist as follows:</u>
WET SIDE: Internal sheet in standard plasterboard type Knauf GKB (A) in accordance with EN 520 – DIN 18180, having the following technical characteristics:
- Sheet thickness 12.5 mm
- Fire reaction class: A2-s1, d0 (B)
- Density: 680 kg/m3 approx.
- Thermal conductivity λ: 0.20 W/mK
- Water vapour permeability (EN 10465-2008): 10 dry - 4 wet
- Tested from a bio-housing point of view according to the certificate issued by the Institute of Bioarchitecture in Rosenheim

External plasterboard sheet type Knauf GKI (H) or similar to be submitted to the approval of the D.L., impregnated coated gypsum, subjected to a special procedure to limit moisture absorption, in accordance with EN 520 -DIN 18180 having the following technical characteristics:

- Sheet thickness 12.5 mm;
- Fire reaction class: A2-s1, d0 (B)
- Density: ≥ 700 kg/m³
- Thermal conductivity λ: 0.20 W/mK
- Water absorption after 2 h of immersion: % ≥ 10
- Thermal conductivity l: 0.20 W/mK
- Vapour resistance factor m: 10 dry - 4 wet
- Tested from a bio-housing point of view according to the certificate issued by the Institute of Bioarchitecture in Rosenheim

STANDARD SIDE: double standard plasterboard sheet type Knauf GKB (A) in accordance with EN 520 – DIN 18180, having the following technical characteristics:

- Sheet thickness 12.5 mm
- Fire reaction class: A2-s1, d0 (B)
- Density: 680 kg/m3 approx.
- Thermal conductivity λ: 0.20 W/mK
- Water vapour permeability (EN 10465-2008): 10 dry - 4 wet
- Tested from a bio-housing point of view according to the certificate issued by the Institute of Bioarchitecture in Rosenheim

The slabs will be screwed with phosphated self-drilling screws with flat countersunk head, laid at staggered joints and with a distance of no more than 600mm for the first layer and no more than 250mm for the second layer.
The slabs will be laid in accordance with the procedures prescribed in the UNI 11424:2015 standard and subsequent amendments and additions.
The on-site supply will include the grouting of the joints, corners and screw heads as well as the grouting and sealing of the joints where the slabs are approached, carried out with suitable stucco after applying strips of support reinforced with textile mesh, the subsequent grouting of the surface of the slabs in order to obtain a surface ready for the finish chosen in the project.

The price includes and compensates for the costs for cutting and scraping, corner guards, the formation of door compartments complete with perimeter reinforcement in metal profiles for anchoring the window, the cost of proceeding after the application of the slab while waiting for the execution of electrical and thermo-hydraulic systems to be inserted, the cost for sealing EI between wall and slab with solutions suitable for guaranteeing fire resistance, the charges for the REI closure of plant penetrations of any type and nature, the charges for certifications, technical documentation and forms necessary for the issue of the EI60 Fire Prevention Certificate for dry walls, the formation and dismantling of internal worktops, as well as compliance with the CE marking and the PDO Product

Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and what other necessary to give the finished work in a workmanlike manner.

21.12. DW03 – Standard plasterboard interior partition wall, insulated, 15cm thick

Supply and installation of an internal partition wall in standard plasterboard type Knauf W112, with a total thickness of 15cm, development from slab to slab overall height H max = 7.50 meters, composed as follows:
- double sheet in standard GKB plasterboard, th. 12.5mm
- single self-supporting metal frame, th. 100mm
- insulating layer in glass wool, th. 40+50mm
- double sheet in standard GKB plasterboard, th. 12.5mm

The self-supporting metal frame with development from floor to slab, made with Knauf "E" series profiles in galvanized steel DX51D+ZN- A-C thickness 0.6mm in accordance with EN 14195 and UNI EN 10346, with 1st choice zinc coating and 99% Zn quality, CE marked, consisting of guides at the base "U" 40/100/40mm, th. 0.6mm; "C" uprights 50/100/50mm th. 0.6mm, inserted in the guides, placed at a distance of 400mm and insulated from the perimeter structures with Knauf single-sided adhesive vinyl tape with acoustic cutting function, 3.5mm thick and sealed with putty and/or silicone to completely fill the cracks at the perimeter joints with the primary structures, to achieve the required acoustic performance.
The guides will be constrained to the slab at the base and at the top by means of dowels suitable for the support placed at a distance of no more than 600mm.
The profiles will comply with the harmonized standard EN 14195 concerning "Profiles for Coated Gypsum Sheet Systems" with CE certificate of conformity, in class A1 of reaction to fire, produced according to the UNI-EN-ISO 9001-2000 quality system, with production certified by ICMQ

Filling of the cavity of the metal frame with a double panel type KNAUF INSULATION MINERAL WOOL 35 (λD 0.035 W/mK): glass mineral wool panel without coating suitable for thermal and acoustic insulation of partition walls, false walls.
The insulating panels will be inserted under pressure and continuously in the space between the uprights, laid at staggered joints, well placed together, taking care that they are not in any way compressed between the plasterboard sheets, but have an adequate thickness according to the air gap; provide for any fixing of the same to the uprights of the structure to ensure that the insulating panel remains in place.

<u>The coating of the metal frame will consist as follows:</u>
Double standard plasterboard sheet type Knauf GKB (A) in accordance with EN 520 – DIN 18180, with the following technical characteristics:
- Sheet thickness 12.5 mm
- Fire reaction class: A2-s1, d0 (B)
- Density: 680 kg/m3 approx.
- Thermal conductivity λ: 0.20 W/mK
- Water vapour permeability (EN 10465-2008): 10 dry - 4 wet

- Tested from a bio-housing point of view according to the certificate issued by the Institute of Bioarchitecture in Rosenheim

The slabs will be screwed with phosphated self-drilling screws with flat countersunk head, laid at staggered joints and with a distance of no more than 600mm for the first layer and no more than 250mm for the second layer.
The slabs will be laid in accordance with the procedures prescribed in the UNI 11424:2015 standard and subsequent amendments and additions.
The on-site supply will include the grouting of the joints, corners and screw heads as well as the grouting and sealing of the joints where the slabs are approached, carried out with suitable stucco after applying strips of support reinforced with textile mesh, the subsequent grouting of the surface of the slabs in order to obtain a surface ready for the finish chosen in the project.

The price includes and compensates the costs for the formation of provisional works for the execution of the work in safety, and subsequent dismantling, the temporary protection of floors and elements present within the intervention area with the laying and relative final removal of special protective sheets, the cost for the laying of the decoupling tape at the base and at the top of the substructure, for the cutting and scrapping of the slabs, the corner guards, the formation of door compartments complete with perimeter reinforcement in metal profiles for anchoring the window, the charges for the installation of the insulation, the frame for sliding doors inside the wall if provided for in the project, the structural reinforcement for the loads foreseen in the project, the burden of proceeding after the application of the slabs while waiting for the execution of electrical and thermo-hydraulic systems to be inserted, the charges for acoustic sealing at the plant penetrations, as well as compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

21.13. DW05 – Insulated internal partition wall, EI60 certified, 15cm thick

Supply and installation of an internal partition wall in standard plasterboard type Knauf W112, with a total thickness of 15cm, development from slab to slab overall height H max = 7.50 meters, EI60 certified by classification report carried out by a Qualified Laboratory, composed as follows:
- double sheet in standard GKB plasterboard, th. 12.5mm
- single self-supporting metal frame, th. 100mm
- insulating layer in glass wool, th. 40+50mm
- double sheet in standard GKB plasterboard, th. 12.5mm

The self-supporting metal frame with development from floor to slab, made with Knauf "E" series profiles in galvanized steel DX51D+ZN- A-C thickness 0.6mm in accordance with EN 14195 and UNI EN 10346, with 1st choice zinc coating and 99% Zn quality, CE marked, consisting of guides at the base "U" 40/100/40mm, th. 0.6mm; "C" uprights 50/100/50mm th. 0.6mm, inserted in the guides, placed at a distance of 400mm and insulated from the perimeter structures with Knauf single-sided adhesive vinyl tape with acoustic cutting function, 3.5mm thick and sealed with putty and/or silicone to completely fill the cracks at the perimeter joints with the primary structures, to achieve the required acoustic performance.

The guides will be constrained to the slab at the base and at the top by means of dowels suitable for the support placed at a distance of no more than 600mm.
The profiles will comply with the harmonized standard EN 14195 concerning "Profiles for Coated Gypsum Sheet Systems" with CE certificate of conformity, in class A1 of reaction to fire, produced according to the UNI-EN-ISO 9001-2000 quality system, with production certified by ICMQ

Filling of the cavity of the metal frame with a double panel type KNAUF INSULATION MINERAL WOOL 35 (λD 0.035 W/mK): glass mineral wool panel without coating suitable for thermal and acoustic insulation of partition walls, false walls.
The insulating panels will be inserted under pressure and continuously in the space between the uprights, laid at staggered joints, well placed together, taking care that they are not in any way compressed between the plasterboard sheets, but have an adequate thickness according to the air gap; provide for any fixing of the same to the uprights of the structure to ensure that the insulating panel remains in place.

The coating of the metal frame will consist as follows:
Double standard plasterboard sheet type Knauf GKB (A) in accordance with EN 520 – DIN 18180, with the following technical characteristics:

- Sheet thickness 12.5 mm
- Fire reaction class: A2-s1, d0 (B)
- Density: 680 kg/m3 approx.
- Thermal conductivity λ: 0.20 W/mK
- Water vapour permeability (EN 10465-2008): 10 dry - 4 wet
- Tested from a bio-housing point of view according to the certificate issued by the Institute of Bioarchitecture in Rosenheim

The slabs will be screwed with phosphated self-drilling screws with flat countersunk head, laid at staggered joints and with a distance of no more than 600mm for the first layer and no more than 250mm for the second layer.
The slabs will be laid in accordance with the procedures prescribed in the UNI 11424:2015 standard and subsequent amendments and additions.
The on-site supply will include the grouting of the joints, corners and screw heads as well as the grouting and sealing of the joints where the slabs are approached, carried out with suitable stucco after applying strips of support reinforced with textile mesh, the subsequent grouting of the surface of the slabs in order to obtain a surface ready for the finish chosen in the project.

The price includes and compensates for the costs for cutting and scraping, corner guards, the formation of door compartments complete with perimeter reinforcement in metal profiles for anchoring the window, the cost of proceeding after the application of the slab while waiting for the execution of electrical and thermo-hydraulic systems to be inserted, the cost for sealing EI between wall and slab with solutions suitable for guaranteeing fire resistance, the charges for the REI closure of plant penetrations of any type and nature, the charges for certifications, technical documentation and forms necessary for the issue of the EI60 Fire Prevention Certificate for dry walls, the formation

and dismantling of internal worktops, as well as compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and what other necessary to give the finished work in a workmanlike manner.

21.14. DW06 – RC3 internal insulated anti-intrusion partition wall with 6 Diamant type sheets, 4 galvanized sheets, total thickness 129mm, EI60 certified

Supply and installation of an internal partition wall with single metal frame and triple cladding made of gypsum sheets covered with interposed metal sheet, type Knauf W118, in anti-intrusion security class RC3 (WK3) according to the UNI EN 1627 standard, with a total thickness of 129mm, with soundproofing power Rw = 68 dB (1).
The metal frame will be made with Knauf type profiles with CE marking in compliance with the UNI EN 14195 standard concerning "Profiles for Coated Gypsum Slab Systems", in class A1 reaction to fire, with the dimensions of:
- Ground and top guide U 40/50/40 mm, thickness 0.6 mm
- C uprights 50/50/50 mm, thickness 0.6 mm, placed with a distance of no more than 300 mm

The profiles will be made of galvanized steel DX51D+Z–M/N-A-C in accordance with UNI EN 10346, with yield strength = 300 N/mm², first choice classification, zinc coating with 99% Zn quality, with surface protection by chemical passivation and profiling oiling.
The warping will be isolated from the perimeter structures with Knauf single/double-sided adhesive tape with acoustic cutting function, 3.5 mm thick.

A 45mm thick glass mineral wool insulating roll without coating type Knauf Insulation Ultracoustic R will be inserted inside the frame.

Coating on each side of the metal frame with a triple layer of Knauf Diamant (DFH2IR) type coated gypsum sheets, high performance, fireproof, water-repellent, high density and mechanical resistance, with greater surface hardness and capacity to suspended loads, reinforced with mineral fibers and additives for better adhesion of the gypsum core under the action of fire, type, CE marked (EN 520), equipped with EPD (according to ISO 14025 and EN 15804), in emission class A+ (VOC test according to UNI EN ISO 16000-9:2006), with the following characteristics:
- Fire reaction class: A2, s1-d0 (UNI EN 13501-1)
- Density: = 1000 kg/m3
- Thermal conductivity (?): 0.25 W/m·K (UNI EN 12664)
- Surface hardness (indentation): = 15 mm Ø (EN 520)

In the plane of the sheets (between the first and second sheets and between the second and third sheets) galvanized steel sheets with a thickness of about 0.5 mm are interposed. In the overlapping of sheet metal, an overlap of at least 100 mm must be made both vertically and horizontally.
The use of Knauf Fugenfuller gypsum-based powder filler is prescribed for the finishing of the joints. In powder, ready to mix, it mixes only with water, does not lump and has excellent adhesiveness, CE marked (UNI EN 13963) and in emission class A+ (VOC test according to UNI EN ISO 16000-9:2006), with the following characteristics:
- Fire reaction class: A1 (UNI EN 13963)

The methods for installation will comply with the UNI 11424 standards and the manufacturer's technical documentation.

The price includes and compensates for the costs for cutting and scraping, corner guards, the formation of door compartments complete with perimeter reinforcement in metal profiles for anchoring the window, the cost of proceeding after the application of the slab while waiting for the execution of electrical and thermo-hydraulic systems to be inserted, the cost for sealing EI between wall and slab with solutions suitable for guaranteeing fire resistance, the charges for the REI closure of plant penetrations of any type and nature, the charges for certifications, technical documentation and forms necessary for the issue of the EI60 Fire Prevention Certificate for dry walls, the formation and dismantling of internal worktops, as well as compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and what other necessary to give the finished work in a workmanlike manner.

21.15. DW07 – Insulated interior wall, 15cm thick, for wet rooms

Supply and installation of an internal plasterboard wall type Knauf W112, with a total thickness of 15cm, partition for wet environments, development from slab to floor overall height H max = 7.50 meters, composed as follows:
- external sheet in water-repellent plasterboard GKI, th. 12.5mm
- GKB standard plasterboard internal sheet, th. 12.5mm
- single self-supporting metal frame, th. 100mm
- insulating layer in glass wool, th. 40+50mm
- GKB standard plasterboard internal sheet, th. 12.5mm
- external sheet in water-repellent plasterboard GKI, th. 12.5mm

The self-supporting metal frame with development from floor to slab, made with Knauf "E" series profiles in galvanized steel DX51D+ZN- A-C thickness 0.6mm in accordance with EN 14195 and UNI EN 10346, with 1st choice zinc coating and 99% Zn quality, CE marked, consisting of guides at the base "U" 40/100/40mm, th. 0.6mm; "C" uprights 50/100/50mm th. 0.6mm, inserted in the guides, placed at a distance of 400mm and insulated from the perimeter structures with Knauf single-sided adhesive vinyl tape with acoustic cutting function, 3.5mm thick and sealed with putty and/or silicone to completely fill the cracks at the perimeter joints with the primary structures, to achieve the required acoustic performance.
The guides will be constrained to the slab at the base and at the top by means of dowels suitable for the support placed at a distance of no more than 600mm.
The profiles will comply with the harmonized standard EN 14195 concerning "Profiles for Coated Gypsum Sheet Systems" with CE certificate of conformity, in class A1 of reaction to fire, produced according to the UNI-EN-ISO 9001-2000 quality system, with production certified by ICMQ

Filling of the cavity of the metal frame with a double panel type KNAUF INSULATION MINERAL WOOL 35 (λD 0.035 W/mK): glass mineral wool panel without coating suitable for thermal and acoustic insulation of partition walls, false walls.
The insulating panels will be inserted under pressure and continuously in the space between the uprights, laid at staggered joints, well placed together, taking care that they are not in any way

compressed between the plasterboard sheets, but have an adequate thickness according to the air gap; provide for any fixing of the same to the uprights of the structure to ensure that the insulating panel remains in place.

The coating of the metal frame will consist as follows:
Interior plasterboard standard Knauf GKB (A) type in accordance with EN 520 – DIN 18180, having the following technical characteristics:

- Sheet thickness 12.5 mm
- Fire reaction class: A2-s1, d0 (B)
- Density: 680 kg/m3 approx.
- Thermal conductivity λ: 0.20 W/mK
- Water vapour permeability (EN 10465-2008): 10 dry - 4 wet
- Tested from a bio-housing point of view according to the certificate issued by the Institute of Bioarchitecture in Rosenheim

External plasterboard sheet type Knauf GKI (H) or similar to be submitted to the approval of the D.L., impregnated coated gypsum, subjected to a special procedure to limit moisture absorption, in accordance with EN 520 -DIN 18180 having the following technical characteristics:

- Sheet thickness 12.5 mm
- Fire reaction class: A2-s1, d0 (B)
- Density: ≥ 700 kg/m³
- Thermal conductivity λ: 0.20 W/mK
- Water absorption after 2 h of immersion: % ≥ 10
- Thermal conductivity l: 0.20 W/mK
- Vapour resistance factor m: 10 dry - 4 wet
- Tested from a bio-housing point of view according to the certificate issued by the Institute of Bioarchitecture in Rosenheim

The slabs will be screwed with phosphated self-drilling screws with flat countersunk head, laid at staggered joints and with a distance of no more than 600mm for the first layer and no more than 250mm for the second layer.
The slabs will be laid in accordance with the procedures prescribed in the UNI 11424:2015 standard and subsequent amendments and additions.
The on-site supply will include the grouting of the joints, corners and screw heads as well as the grouting and sealing of the joints where the slabs are approached, carried out with suitable stucco after applying strips of support reinforced with textile mesh, the subsequent grouting of the surface of the slabs in order to obtain a surface ready for the finish chosen in the project.

The price includes and compensates the costs for the formation of provisional works for the execution of the work in safety, and subsequent dismantling, the temporary protection of floors and elements present within the intervention area with the laying and relative final removal of special protective

sheets, the cost for the laying of the decoupling tape at the base and at the top of the substructure, for the cutting and scrapping of the slabs, the corner guards, the formation of door compartments complete with perimeter reinforcement in metal profiles for anchoring the window, the charges for the installation of the insulation, the frame for sliding doors inside the wall if provided for in the project, the structural reinforcement for the loads foreseen in the project, the burden of proceeding after the application of the slabs while waiting for the execution of electrical and thermo-hydraulic systems to be inserted, the charges for acoustic sealing at the plant penetrations, as well as compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

21.16. DW08 – Insulated internal wall, 15cm thick, partition between wet and standard environments

Supply and installation of an internal plasterboard wall type Knauf W112, with a total thickness of 15cm, partition between the wet environment and the standard environment, development from slab to floor overall height H max = 7.50 meters, composed as follows:
- external sheet in water-repellent plasterboard GKI, th. 12.5mm
- GKB standard plasterboard internal sheet, th. 12.5mm
- single self-supporting metal frame, th. 100mm
- insulating layer in glass wool, th. 40+50mm
- double sheet in standard GKB plasterboard, th. 12.5mm

The self-supporting metal frame with development from floor to slab, made with Knauf "E" series profiles in galvanized steel DX51D+ZN- A-C thickness 0.6mm in accordance with EN 14195 and UNI EN 10346, with 1st choice zinc coating and 99% Zn quality, CE marked, consisting of guides at the base "U" 40/100/40mm, th. 0.6mm; "C" uprights 50/100/50mm th. 0.6mm, inserted in the guides, placed at a distance of 400mm and insulated from the perimeter structures with Knauf single-sided adhesive vinyl tape with acoustic cutting function, 3.5mm thick and sealed with putty and/or silicone to completely fill the cracks at the perimeter joints with the primary structures, to achieve the required acoustic performance.
The guides will be constrained to the slab at the base and at the top by means of dowels suitable for the support placed at a distance of no more than 600mm.
The profiles will comply with the harmonized standard EN 14195 concerning "Profiles for Coated Gypsum Sheet Systems" with CE certificate of conformity, in class A1 of reaction to fire, produced according to the UNI-EN-ISO 9001-2000 quality system, with production certified by ICMQ

Filling of the cavity of the metal frame with a double panel type KNAUF INSULATION MINERAL WOOL 35 (λD 0.035 W/mK): glass mineral wool panel without coating suitable for thermal and acoustic insulation of partition walls, false walls.
The insulating panels will be inserted under pressure and continuously in the space between the uprights, laid at staggered joints, well placed together, taking care that they are not in any way compressed between the plasterboard sheets, but have an adequate thickness according to the air gap; provide for any fixing of the same to the uprights of the structure to ensure that the insulating panel remains in place.

The coating of the metal frame will consist as follows:
WET SIDE: Internal sheet in standard plasterboard type Knauf GKB (A) in accordance with EN 520 – DIN 18180, having the following technical characteristics:

- Sheet thickness 12.5 mm
- Fire reaction class: A2-s1, d0 (B)
- Density: 680 kg/m3 approx.
- Thermal conductivity λ: 0.20 W/mK
- Water vapour permeability (EN 10465-2008): 10 dry - 4 wet
- Tested from a bio-housing point of view according to the certificate issued by the Institute of Bioarchitecture in Rosenheim

External plasterboard sheet type Knauf GKI (H) or similar to be submitted to the approval of the D.L., impregnated coated gypsum, subjected to a special procedure to limit moisture absorption, in accordance with EN 520 -DIN 18180 having the following technical characteristics:

- Sheet thickness 12.5 mm;
- Fire reaction class: A2-s1, d0 (B)
- Density: ≥ 700 kg/m³
- Thermal conductivity λ: 0.20 W/mK
- Water absorption after 2 h of immersion: % ≥ 10
- Thermal conductivity l: 0.20 W/mK
- Vapour resistance factor m: 10 dry - 4 wet
- Tested from a bio-housing point of view according to the certificate issued by the Institute of Bioarchitecture in Rosenheim

STANDARD SIDE: double standard plasterboard sheet type Knauf GKB (A) in accordance with EN 520 – DIN 18180, having the following technical characteristics:

- Sheet thickness 12.5 mm
- Fire reaction class: A2-s1, d0 (B)
- Density: 680 kg/m3 approx.
- Thermal conductivity λ: 0.20 W/mK
- Water vapour permeability (EN 10465-2008): 10 dry - 4 wet
- Tested from a bio-housing point of view according to the certificate issued by the Institute of Bioarchitecture in Rosenheim

The slabs will be screwed with phosphated self-drilling screws with flat countersunk head, laid at staggered joints and with a distance of no more than 600mm for the first layer and no more than 250mm for the second layer.
The slabs will be laid in accordance with the procedures prescribed in the UNI 11424:2015 standard and subsequent amendments and additions.

The on-site supply will include the grouting of the joints, corners and screw heads as well as the grouting and sealing of the joints where the slabs are approached, carried out with suitable stucco after applying strips of support reinforced with textile mesh, the subsequent grouting of the surface of the slabs in order to obtain a surface ready for the finish chosen in the project.

The price includes and compensates the costs for the formation of provisional works for the execution of the work in safety, and subsequent dismantling, the temporary protection of floors and elements present within the intervention area with the laying and relative final removal of special protective sheets, the cost for the laying of the decoupling tape at the base and at the top of the substructure, for the cutting and scrapping of the slabs, the corner guards, the formation of door compartments complete with perimeter reinforcement in metal profiles for anchoring the window, the charges for the installation of the insulation, the frame for sliding doors inside the wall if provided for in the project, the structural reinforcement for the loads foreseen in the project, the burden of proceeding after the application of the slabs while waiting for the execution of electrical and thermo-hydraulic systems to be inserted, the charges for acoustic sealing at the plant penetrations, as well as compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

21.17. DW10 – Plasterboard counterwall insulated with vapour barrier, 7.50cm thick

Supply and installation of insulated plasterboard counterwall with vapour barrier coupled with Knauf W626 type slab, total thickness 7.50cm, with development from slab to floor for H max 7.50 meters, composed as follows:
- standard plasterboard sheet GKB, th. 12.5mm
- GKB Advanced plasterboard with vapour barrier (BV), th. 12.5mm
- insulating layer in glass wool, th. 40mm
- single self-supporting metal frame, th. 50mm

With a self-supporting metal frame of 50mm independent of the external wall behind, placed at a distance from it, it will be made with Knauf type profiles in galvanized steel with a yield strength of 300 N/mm², compliant with the European standard UNI EN 10346, with 1st choice zinc coating and 99% Zn quality, 0.6 steel thickness consisting of 40x50x40mm "U" guides; 50x50x50mm "C" uprights, inserted in the guides, with a 600mm spacing, insulated from the perimeter structures with double-sided closed-cell polyethylene foam tape, type Knauf K434 with acoustic cutting function, 3.5 mm thick and sealed with putty and/or silicone to completely fill the cracks at the perimeter joints with the primary structures, to achieve the required acoustic performance.
The guides will be constrained at the base and at the top of the slab by means of dowels suitable for the support placed at a distance of no more than 500mm.
The profiles will comply with the harmonized standard EN 14195 concerning "Profiles for Coated Gypsum Sheet Systems" with CE certificate of conformity, in class A1 of reaction to fire, produced according to the UNI-EN-ISO 9001-2000 quality system, with production certified by ICMQ.

Filling of the cavity of the metal frame with a double panel type KNAUF INSULATION MINERAL WOOL 35 (λD 0.035 W/mK): glass mineral wool panel without coating suitable for thermal and acoustic insulation of partition walls, false walls.
The insulating panels will be inserted under pressure and continuously in the space between the uprights, laid at staggered joints, well placed together, taking care that they are not in any way compressed between the plasterboard sheets, but have an adequate thickness according to the air gap; provide for any fixing of the same to the uprights of the structure to ensure that the insulating panel remains in place.

The coating of the metal frame will consist as follows:
External sheet in standard plasterboard type Knauf GKB (A) in accordance with EN 520 – DIN 18180, having the following technical characteristics:

- Sheet thickness 12.5 mm
- Fire reaction class: A2-s1, d0 (B)
- Density: 680 kg/m3 approx.
- Thermal conductivity λ: 0.20 W/mK
- Water vapour permeability (EN 10465-2008): 10 dry - 4 wet
- Tested from a bio-housing point of view according to the certificate issued by the Institute of Bioarchitecture in Rosenheim

Internal plasterboard sheet type Knauf GKB Advanced with vapour barrier or similar to be submitted to the approval of the D.L., in gypsum coated with vapour barrier, in accordance with EN 520 – UNI EN 14190, having the following technical characteristics:

- Sheet thickness 12.5 mm;
- Fire reaction class: A2-s1, d0 (B)
- Density: 600 kg/m³
- Thermal conductivity λ: 0.20 W/mK
- Water absorption after 2 h of immersion: % ≥ 10
- Thermal conductivity l: 0.19 W/mK
- Vapour resistance factor m: 9.2 dry – 5.7 wet
- Tested from a bio-housing point of view according to the certificate issued by the Institute of Bioarchitecture in Rosenheim

The slabs will be screwed with phosphated self-drilling screws with flat countersunk head, laid at staggered joints and with a distance of no more than 600mm for the first layer and no more than 250mm for the second layer.
The slabs will be laid in accordance with the procedures prescribed in the UNI 11424:2015 standard and subsequent amendments and additions.
The on-site supply will include the grouting of the joints, corners and screw heads as well as the grouting and sealing of the joints where the slabs are approached, carried out with suitable stucco

after applying strips of support reinforced with textile mesh, the subsequent grouting of the surface of the slabs in order to obtain a surface ready for the finish chosen in the project.

The price includes and compensates the costs for the formation of provisional works for the safe execution of the works and subsequent disassembly, the temporary protection of floors and elements within the intervention area with the installation and final removal of special protective sheets, the supply and installation of insulation, the cutting and scrapping of the slabs, corner guards, the formation of door compartments complete with perimeter reinforcement in metal profiles for anchoring the window, the charges for the installation of frames for sliding doors inside the wall if provided for in the project, the burden of proceeding after the application of the slabs while waiting for the execution of electrical and thermo-hydraulic systems to be inserted, the charges for acoustic sealing at the system penetrations, the charges for acoustic certifications and testing, as well as compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

21.18. DW11 – Plasterboard false wall for wet environments, insulated with vapour barrier, 7.50cm thick

Supply and installation of plasterboard false wall for wet environments type Knauf W626, insulated and with vapour barrier coupled to the slab, total thickness 7.50cm, with development from slab to floor for H max 7.50 meters, composed as follows:
- GKI water-repellent plasterboard sheet, th. 12.5 mm
- GKB Advanced plasterboard with vapour barrier (BV), th. 12.5mm
- insulating layer in glass wool, th. 40mm
- single self-supporting metal frame, th. 50mm

With a self-supporting metal frame of 50mm independent of the external wall behind, placed at a distance from it, it will be made with Knauf type profiles in galvanized steel with a yield strength of 300 N/mm², compliant with the European standard UNI EN 10346, with 1st choice zinc coating and 99% Zn quality, 0.6 steel thickness consisting of 40x50x40mm "U" guides; 50x50x50mm "C" uprights, inserted in the guides, with a 600mm spacing, insulated from the perimeter structures with double-sided closed-cell polyethylene foam tape, type Knauf K434 with acoustic cutting function, 3.5 mm thick and sealed with putty and/or silicone to completely fill the cracks at the perimeter joints with the primary structures, to achieve the required acoustic performance.
The guides will be constrained at the base and at the top of the slab by means of dowels suitable for the support placed at a distance of no more than 500mm.
The profiles will comply with the harmonized standard EN 14195 concerning "Profiles for Coated Gypsum Sheet Systems" with CE certificate of conformity, in class A1 of reaction to fire, produced according to the UNI-EN-ISO 9001-2000 quality system, with production certified by ICMQ.

Filling of the cavity of the metal frame with a double panel type KNAUF INSULATION MINERAL WOOL 35 (λD 0.035 W/mK): glass mineral wool panel without coating suitable for thermal and acoustic insulation of partition walls, false walls.

The insulating panels will be inserted under pressure and continuously in the space between the uprights, laid at staggered joints, well placed together, taking care that they are not in any way compressed between the plasterboard sheets, but have an adequate thickness according to the air gap; provide for any fixing of the same to the uprights of the structure to ensure that the insulating panel remains in place.

The coating of the metal frame will consist as follows:
External plasterboard sheet type Knauf GKI (H) or similar to be submitted to the approval of the D.L., impregnated coated gypsum, subjected to a special procedure to limit moisture absorption, in accordance with EN 520 -DIN 18180 having the following technical characteristics:

- Sheet thickness 12.5 mm;
- Fire reaction class: A2-s1, d0 (B)
- Density: ≥ 700 kg/m³
- Thermal conductivity λ: 0.20 W/mK
- Water absorption after 2 h of immersion: % ≥ 10
- Thermal conductivity l: 0.20 W/mK
- Vapour resistance factor m: 10 dry - 4 wet
- Tested from a bio-housing point of view according to the certificate issued by the Institute of Bioarchitecture in Rosenheim

Internal plasterboard sheet type Knauf GKB Advanced with vapour barrier or similar to be submitted to the approval of the D.L., in gypsum coated with vapour barrier, in accordance with EN 520 – UNI EN 14190, having the following technical characteristics:

- Sheet thickness 12.5 mm;
- Fire reaction class: A2-s1, d0 (B)
- Density: 600 kg/m³
- Thermal conductivity λ: 0.20 W/mK
- Water absorption after 2 h of immersion: % ≥ 10
- Thermal conductivity l: 0.19 W/mK
- Vapour resistance factor m: 9.2 dry – 5.7 wet
- Tested from a bio-housing point of view according to the certificate issued by the Institute of Bioarchitecture in Rosenheim

The slabs will be screwed with phosphated self-drilling screws with flat countersunk head, laid at staggered joints and with a distance of no more than 600mm for the first layer and no more than 250mm for the second layer.
The slabs will be laid in accordance with the procedures prescribed in the UNI 11424:2015 standard and subsequent amendments and additions.
The on-site supply will include the grouting of the joints, corners and screw heads as well as the grouting and sealing of the joints where the slabs are approached, carried out with suitable stucco

after applying strips of support reinforced with textile mesh, the subsequent grouting of the surface of the slabs in order to obtain a surface ready for the finish chosen in the project.

The price includes and compensates the costs for the formation of provisional works for the safe execution of the works and subsequent disassembly, the temporary protection of floors and elements within the intervention area with the installation and final removal of special protective sheets, the supply and installation of insulation, the cutting and scrapping of the slabs, corner guards, the formation of door compartments complete with perimeter reinforcement in metal profiles for anchoring the window, the charges for the installation of frames for sliding doors inside the wall if provided for in the project, the burden of proceeding after the application of the slabs while waiting for the execution of electrical and thermo-hydraulic systems to be inserted, the charges for acoustic sealing at the system penetrations, the charges for acoustic certifications and testing, as well as compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

21.19. DW12 - Single sheet cladding of standard plasterboard type Knauf GKB

On-site cladding made with standard plasterboard sheet type Knauf GKB (A) in accordance with EN 520 – DIN 18180, having the following technical characteristics:

- Sheet thickness 12.5 mm
- Fire reaction class: A2-s1, d0 (B)
- Density: 680 kg/m3 approx.
- Thermal conductivity λ: 0.20 W/mK
- Water vapour permeability (EN 10465-2008): 10 dry – 4 wet
- Tested from a bio-housing point of view according to the certificate issued by the Institute of Bioarchitecture in Rosenheim

Applied to the existing backing with Knauf "Perlfix" putty, the backing must be resistant, stable, clean and dust-free.
Total thickness 20mm excluding finish.
In the case of a smooth surface, a dispersion adhesion based on quartz sand and synthetic material, highly resistant to alkalis, suitable for the treatment of very smooth surfaces or surfaces with low absorption capacity, such as Knauf Betokontakt must be applied, carried out as a primer coat on very smooth surfaces or surfaces with low absorption capacity (concrete), consisting of dispersion based on quartz sand and synthetic material, highly resistant to alkalis, applied pure by roller or brush or sprayed uniformly by machine on the substrate, capable of providing a finished surface ready for subsequent coating.
In the case of absorbent brick-type surfaces, the substrate must be treated with an insulating primer, a dispersion primer based on synthetic resin with high resistance to alkalis, such as Knauf Grundiermittel, a synthetic resin-based compound with high resistance to alkalis, applied by spray or roller or brush uniformly on the substrate, capable of providing a finished surface ready for subsequent coating.

The costs for checking the flatness and preparation of the support, cutting, scrap, corner guards, the formation and dismantling of internal worktops, the disposal of waste materials, as well as compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the work are included and compensated in the price.

21.20. DW18 – Insulated internal partition wall, EI60 certified, 10cm thick

Supply and installation of an internal partition wall in standard plasterboard type Knauf W112, with a total thickness of 10cm, overall height H max = 7.50 meters, EI60 certified, composed as follows:
- double sheet in standard GKB plasterboard, th. 12.5mm
- single self-supporting metal frame, th. 50mm
- insulating layer in glass wool, th. 40mm
- double sheet in standard GKB plasterboard, th. 12.5mm

The self-supporting metal frame with development from floor to slab, made with Knauf "E" series profiles in galvanized steel DX51D+ZN- A-C thickness 0.6mm in accordance with EN 14195 and UNI EN 10346, with 1st choice zinc coating and Zn 99% quality, CE marked, consisting of guides at the base "U" 40/50/40mm, th. 0.6mm; "C" uprights 50/50/50mm th. 0.6mm, inserted in the guides, placed at a distance of 400mm and insulated from the perimeter structures with Knauf single-sided adhesive vinyl tape with acoustic cutting function, 3.5mm thick and sealed with putty and/or silicone to completely fill the cracks at the perimeter joints with the primary structures, to achieve the required acoustic performance.
The guides will be constrained to the slab at the base and at the top by means of dowels suitable for the support placed at a distance of no more than 600mm.
The profiles will comply with the harmonized standard EN 14195 concerning "Profiles for Coated Gypsum Sheet Systems" with CE certificate of conformity, in class A1 of reaction to fire, produced according to the UNI-EN-ISO 9001-2000 quality system, with production certified by ICMQ

Filling of the cavity of the metal frame with KNAUF INSULATION MINERAL WOOL 35 (λD 0.035 W/mK) type panel: glass mineral wool panel without coating suitable for thermal and acoustic insulation of partition walls, false walls.
The insulating panels will be inserted under pressure and continuously in the space between the uprights, laid at staggered joints, well placed together, taking care that they are not in any way compressed between the plasterboard sheets, but have an adequate thickness according to the air gap; provide for any fixing of the same to the uprights of the structure to ensure that the insulating panel remains in place.

<u>The coating of the metal frame will consist as follows:</u>
Double standard plasterboard sheet type Knauf GKB (A) in accordance with EN 520 – DIN 18180, with the following technical characteristics:
- Sheet thickness 12.5 mm
- Fire reaction class: A2-s1, d0 (B)
- Density: 680 kg/m3 approx.
- Thermal conductivity λ: 0.20 W/mK

- Water vapour permeability (EN 10465-2008): 10 dry - 4 wet
- Tested from a bio-housing point of view according to the certificate issued by the Institute of Bioarchitecture in Rosenheim

The slabs will be screwed with phosphated self-drilling screws with flat countersunk head, laid at staggered joints and with a distance of no more than 600mm for the first layer and no more than 250mm for the second layer.
The slabs will be laid in accordance with the procedures prescribed in the UNI 11424:2015 standard and subsequent amendments and additions.
The on-site supply will include the grouting of the joints, corners and screw heads as well as the grouting and sealing of the joints where the slabs are approached, carried out with suitable stucco after applying strips of support reinforced with textile mesh, the subsequent grouting of the surface of the slabs in order to obtain a surface ready for the finish chosen in the project.

The price includes and compensates for the costs for cutting and scraping, corner guards, the formation of door compartments complete with perimeter reinforcement in metal profiles for anchoring the window, the cost of proceeding after the application of the slab while waiting for the execution of electrical and thermo-hydraulic systems to be inserted, the cost for sealing EI between wall and slab with solutions suitable for guaranteeing fire resistance, the charges for the REI closure of plant penetrations of any type and nature, the charges for certifications, technical documentation and forms necessary for the issue of the EI60 Fire Prevention Certificate for dry walls, the formation and dismantling of internal worktops, as well as compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and what other necessary to give the finished work in a workmanlike manner.

21.21. DW19 – Insulated internal wall, 20cm thick, partition between wet and standard environment

Supply and installation of an internal plasterboard wall type Knauf W112, with a total thickness of 20cm, partition between the humid environment and the standard environment, development from slab to floor overall height H max = 7.50 meters, composed as follows:
- external sheet in water-repellent plasterboard GKI, th. 12.5mm
- GKB standard plasterboard internal sheet, th. 12.5mm
- single self-supporting metal frame, th. 150mm
- insulating layer in glass wool, th. 100mm
- double sheet in standard GKB plasterboard, th. 12.5mm

The self-supporting metal frame with development from floor to slab, made with Knauf "E" series profiles in galvanized steel DX51D+ZN- A-C thickness 0.6mm in accordance with EN 14195 and UNI EN 10346, with 1st choice zinc coating and 99% Zn quality, CE marked, consisting of guides at the base "U" 40/100/40mm, th. 0.6mm; "C" uprights 50/100/50mm th. 0.6mm, inserted in the guides, placed at a distance of 400mm and insulated from the perimeter structures with Knauf single-sided adhesive vinyl tape with acoustic cutting function, 3.5mm thick and sealed with putty and/or silicone

to completely fill the cracks at the perimeter joints with the primary structures, to achieve the required acoustic performance.
The guides will be constrained to the slab at the base and at the top by means of dowels suitable for the support placed at a distance of no more than 600mm.
The profiles will comply with the harmonized standard EN 14195 concerning "Profiles for Coated Gypsum Sheet Systems" with CE certificate of conformity, in class A1 of reaction to fire, produced according to the UNI-EN-ISO 9001-2000 quality system, with production certified by ICMQ

Filling of the cavity of the metal frame with KNAUF INSULATION MINERAL WOOL 35 (λD 0.035 W/mK) type panel: glass mineral wool panel without coating suitable for thermal and acoustic insulation of partition walls, false walls.
The insulating panels will be inserted under pressure and continuously in the space between the uprights, laid at staggered joints, well placed together, taking care that they are not in any way compressed between the plasterboard sheets, but have an adequate thickness according to the air gap; provide for any fixing of the same to the uprights of the structure to ensure that the insulating panel remains in place.

<u>The coating of the metal frame will consist as follows:</u>
WET SIDE: Internal sheet in standard plasterboard type Knauf GKB (A) in accordance with EN 520 – DIN 18180, having the following technical characteristics:

- Sheet thickness 12.5 mm
- Fire reaction class: A2-s1, d0 (B)
- Density: 680 kg/m3 approx.
- Thermal conductivity λ: 0.20 W/mK
- Water vapour permeability (EN 10465-2008): 10 dry - 4 wet
- Tested from a bio-housing point of view according to the certificate issued by the Institute of Bioarchitecture in Rosenheim

External plasterboard sheet type Knauf GKI (H) or similar to be submitted to the approval of the D.L., impregnated coated gypsum, subjected to a special procedure to limit moisture absorption, in accordance with EN 520 -DIN 18180 having the following technical characteristics:

- Sheet thickness 12.5 mm;
- Fire reaction class: A2-s1, d0 (B)
- Density: ≥ 700 kg/m³
- Thermal conductivity λ: 0.20 W/mK
- Water absorption after 2 h of immersion: % ≥ 10
- Thermal conductivity l: 0.20 W/mK
- Vapour resistance factor m: 10 dry - 4 wet
- Tested from a bio-housing point of view according to the certificate issued by the Institute of Bioarchitecture in Rosenheim

STANDARD SIDE: double standard plasterboard sheet type Knauf GKB (A) in accordance with EN 520 – DIN 18180, having the following technical characteristics:

- Sheet thickness 12.5 mm
- Fire reaction class: A2-s1, d0 (B)
- Density: 680 kg/m3 approx.
- Thermal conductivity λ: 0.20 W/mK
- Water vapour permeability (EN 10465-2008): 10 dry - 4 wet
- Tested from a bio-housing point of view according to the certificate issued by the Institute of Bioarchitecture in Rosenheim

The slabs will be screwed with phosphated self-drilling screws with flat countersunk head, laid at staggered joints and with a distance of no more than 600mm for the first layer and no more than 250mm for the second layer.
The slabs will be laid in accordance with the procedures prescribed in the UNI 11424:2015 standard and subsequent amendments and additions.
The on-site supply will include the grouting of the joints, corners and screw heads as well as the grouting and sealing of the joints where the slabs are approached, carried out with suitable stucco after applying strips of support reinforced with textile mesh, the subsequent grouting of the surface of the slabs in order to obtain a surface ready for the finish chosen in the project.

The price includes and compensates the costs for the formation of provisional works for the execution of the work in safety, and subsequent dismantling, the temporary protection of floors and elements present within the intervention area with the laying and relative final removal of special protective sheets, the cost for the laying of the decoupling tape at the base and at the top of the substructure, for the cutting and scrapping of the slabs, the corner guards, the formation of door compartments complete with perimeter reinforcement in metal profiles for anchoring the window, the charges for the installation of the insulation, the frame for sliding doors inside the wall if provided for in the project, the structural reinforcement for the loads foreseen in the project, the burden of proceeding after the application of the slabs while waiting for the execution of electrical and thermo-hydraulic systems to be inserted, the charges for acoustic sealing at the plant penetrations, as well as compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

21.22. DW22 – Insulated plasterboard counterwall, thickness 17.50cm – WET ROOMS

Supply and installation of a Knauf W626 type plasterboard false wall, total thickness of 17.50cm, with development from floor to slab H max 7.50 meters, composed as follows:
- external sheet in water-repellent plasterboard GKI, th. 12.5 mm
- GKB standard plasterboard internal sheet, th. 12.5 mm
- insulating layer in glass wool, th. 100+40mm
- single self-supporting metal frame, th. 150mm

150mm self-supporting metal frame, made with Knauf type profiles in galvanized steel with a yield strength of 300 N/mm², compliant with the European standard UNI EN 10346, with 1st choice zinc coating and 99% Zn quality, 0.6 steel thickness consisting of 40x150x40mm "U" guides; 50x150x50mm "C" uprights, inserted in the guides, with a 600mm spacing, insulated from the perimeter structures with double-sided adhesive tape in closed-cell polyethylene foam, type Knauf K434 with acoustic cutting function, 3.5 mm thick and sealed with putty and/or silicone to completely fill the cracks at the perimeter joints with the primary structures, to achieve the required acoustic performance.
The guides will be constrained at the base and at the top of the slab by means of dowels suitable for the support placed at a distance of no more than 500mm.
The profiles will comply with the harmonized standard EN 14195 concerning "Profiles for Coated Gypsum Sheet Systems" with CE certificate of conformity, in class A1 of reaction to fire, produced according to the UNI-EN-ISO 9001-2000 quality system, with production certified by ICMQ.

Filling of the cavity of the metal frame with a double panel type KNAUF INSULATION MINERAL WOOL 35 (λD 0.035 W/mK): glass mineral wool panel without coating suitable for thermal and acoustic insulation of partition walls, false walls.
The insulating panels will be inserted under pressure and continuously in the space between the uprights, laid at staggered joints, well placed together, taking care that they are not in any way compressed between the plasterboard sheets, but have an adequate thickness according to the air gap; provide for any fixing of the same to the uprights of the structure to ensure that the insulating panel remains in place.

<u>The coating of the metal frame will consist as follows:</u>
Interior plasterboard standard Knauf GKB (A) type in accordance with EN 520 – DIN 18180, having the following technical characteristics:

- Sheet thickness 12.5 mm
- Fire reaction class: A2-s1, d0 (B)
- Density: 680 kg/m3 approx.
- Thermal conductivity λ: 0.20 W/mK
- Water vapour permeability (EN 10465-2008): 10 dry - 4 wet
- Tested from a bio-housing point of view according to the certificate issued by the Institute of Bioarchitecture in Rosenheim

External plasterboard sheet type Knauf GKI (H) or similar to be submitted to the approval of the D.L., impregnated coated gypsum, subjected to a special procedure to limit moisture absorption, in accordance with EN 520 -DIN 18180 having the following technical characteristics:

- Sheet thickness 12.5 mm;
- Fire reaction class: A2-s1, d0 (B)
- Density: ≥ 700 kg/m³
- Thermal conductivity λ: 0.20 W/mK
- Water absorption after 2 h of immersion: % ≥ 10

- Thermal conductivity l: 0.20 W/mK
- Vapour resistance factor m: 10 dry - 4 wet
- Tested from a bio-housing point of view according to the certificate issued by the Institute of Bioarchitecture in Rosenheim

The slabs will be screwed with phosphated self-drilling screws with flat countersunk head, laid at staggered joints and with a distance of no more than 600mm for the first layer and no more than 250mm for the second layer.
The slabs will be laid in accordance with the procedures prescribed in the UNI 11424:2015 standard and subsequent amendments and additions.
The on-site supply will include the grouting of the joints, corners and screw heads as well as the grouting and sealing of the joints where the slabs are approached, carried out with suitable stucco after applying strips of support reinforced with textile mesh, the subsequent grouting of the surface of the slabs in order to obtain a surface ready for the finish chosen in the project.

The price includes and compensates the costs for the formation of provisional works for the safe execution of the works and subsequent disassembly, the temporary protection of floors and elements within the intervention area with the installation and final removal of special protective sheets, the supply and installation of insulation, the cutting and scrapping of the slabs, corner guards, the formation of door compartments complete with perimeter reinforcement in metal profiles for anchoring the window, the charges for the installation of frames for sliding doors inside the wall if provided for in the project, the burden of proceeding after the application of the slabs while waiting for the execution of electrical and thermo-hydraulic systems to be inserted, the charges for acoustic sealing at the system penetrations, the charges for acoustic certifications and testing, as well as compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

21.23. DW24 – Insulated internal partition wall, 20cm thick

Supply and installation of an internal partition wall in standard plasterboard type Knauf W112, with a total thickness of 20cm, overall height H max = 7.50 meters, composed as follows:
- double sheet in standard GKB plasterboard, th. 12.5mm
- single self-supporting metal frame, th. 150mm
- insulating layer in glass wool, th. 100+40mm
- double sheet in standard GKB plasterboard, th. 12.5mm

The self-supporting metal frame with slab to slab development, made with Knauf "E" series profiles in galvanized steel DX51D+ZN- A-C 0.6mm thick in accordance with EN 14195 and UNI EN 10346, with 1st choice zinc coating and Zn 99% quality, CE marked, consisting of guides at the base "U" 40/150/40mm, th. 0.6mm; "C" uprights 50/150/50mm th. 0.6mm, inserted in the guides, placed at a distance of 400mm and insulated from the perimeter structures with Knauf single-sided adhesive vinyl tape with acoustic cutting function, 3.5mm thick and sealed with putty and/or silicone to completely fill the cracks at the perimeter joints with the primary structures, to achieve the required acoustic performance.

The guides will be constrained to the slab at the base and at the top by means of dowels suitable for the support placed at a distance of no more than 600mm.
The profiles will comply with the harmonized standard EN 14195 concerning "Profiles for Coated Gypsum Sheet Systems" with CE certificate of conformity, in class A1 of reaction to fire, produced according to the UNI-EN-ISO 9001-2000 quality system, with production certified by ICMQ

Filling of the cavity of the metal frame with a double panel type KNAUF INSULATION MINERAL WOOL 35 (λD 0.035 W/mK): glass mineral wool panel without coating suitable for thermal and acoustic insulation of partition walls, false walls.
The insulating panels will be inserted under pressure and continuously in the space between the uprights, laid at staggered joints, well placed together, taking care that they are not in any way compressed between the plasterboard sheets, but have an adequate thickness according to the air gap; provide for any fixing of the same to the uprights of the structure to ensure that the insulating panel remains in place.

The coating of the metal frame will consist as follows:
Double standard plasterboard sheet type Knauf GKB (A) in accordance with EN 520 – DIN 18180, with the following technical characteristics:

- Sheet thickness 12.5 mm
- Fire reaction class: A2-s1, d0 (B)
- Density: 680 kg/m3 approx.
- Thermal conductivity λ: 0.20 W/mK
- Water vapour permeability (EN 10465-2008): 10 dry - 4 wet
- Tested from a bio-housing point of view according to the certificate issued by the Institute of Bioarchitecture in Rosenheim

The slabs will be screwed with phosphated self-drilling screws with flat countersunk head, laid at staggered joints and with a distance of no more than 600mm for the first layer and no more than 250mm for the second layer.
The slabs will be laid in accordance with the procedures prescribed in the UNI 11424:2015 standard and subsequent amendments and additions.
The on-site supply will include the grouting of the joints, corners and screw heads as well as the grouting and sealing of the joints where the slabs are approached, carried out with suitable stucco after applying strips of support reinforced with textile mesh, the subsequent grouting of the surface of the slabs in order to obtain a surface ready for the finish chosen in the project.

The price includes and compensates the costs for the formation of provisional works for the execution of the work in safety, and subsequent dismantling, the temporary protection of floors and elements present within the intervention area with the laying and relative final removal of special protective sheets, the cost for the laying of the decoupling tape at the base and at the top of the substructure, for the cutting and scrapping of the slabs, the corner guards, the formation of door compartments complete with perimeter reinforcement in metal profiles for anchoring the window, the charges for the installation of the insulation, the frame for sliding doors inside the wall if provided for in the

project, the structural reinforcement for the loads foreseen in the project, the burden of proceeding after the application of the slabs while waiting for the execution of electrical and thermo-hydraulic systems to be inserted, the charges for acoustic sealing at the plant penetrations, as well as compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

21.24. DW27 – Standard Insulated Plasterboard Counterwall, 10cm Thick

Supply and installation of a standard plasterboard counterwall type Knauf W626, total thickness of 10cm, with development from floor to slab, composed as follows:
- external sheet in standard GKB plasterboard, th. 12.5 mm
- GKB standard plasterboard internal sheet, th. 12.5 mm
- insulating layer in glass wool, th. 60mm
- single self-supporting metal frame, th. 75mm

75mm self-supporting metal frame, made with Knauf type profiles in galvanized steel with a yield strength of 300 N/mm², compliant with the European standard UNI EN 10346, with 1st choice zinc coating and 99% Zn quality, 0.6 steel thickness consisting of 40x75x40mm "U" guides; 50x75x50mm "C" uprights, inserted in the guides, with a 600mm spacing, insulated from the perimeter structures with double-sided closed-cell polyethylene foam tape, type Knauf K434 with acoustic cutting function, 3.5 mm thick and sealed with putty and/or silicone to completely fill the cracks at the perimeter joints with the primary structures, to achieve the required acoustic performance.
The guides will be constrained at the base and at the top of the slab by means of dowels suitable for the support placed at a distance of no more than 500mm.
The profiles will comply with the harmonized standard EN 14195 concerning "Profiles for Coated Gypsum Sheet Systems" with CE certificate of conformity, in class A1 of reaction to fire, produced according to the UNI-EN-ISO 9001-2000 quality system, with production certified by ICMQ.

Filling of the cavity of the metal frame with a double panel type KNAUF INSULATION MINERAL WOOL 35 (λD 0.035 W/mK): glass mineral wool panel without coating suitable for thermal and acoustic insulation of partition walls, false walls.
The insulating panels will be inserted under pressure and continuously in the space between the uprights, laid at staggered joints, well placed together, taking care that they are not in any way compressed between the plasterboard sheets, but have an adequate thickness according to the air gap; provide for any fixing of the same to the uprights of the structure to ensure that the insulating panel remains in place.

<u>The coating of the metal frame will consist as follows:</u>
Double standard plasterboard sheet type Knauf GKB (A) in accordance with EN 520 – DIN 18180, with the following technical characteristics:
- Sheet thickness 12.5 mm
- Fire reaction class: A2-s1, d0 (B)
- Density: 680 kg/m3 approx.
- Thermal conductivity λ: 0.20 W/mK

- Water vapour permeability (EN 10465-2008): 10 dry - 4 wet
- Tested from a bio-housing point of view according to the certificate issued by the Institute of Bioarchitecture in Rosenheim

The slabs will be screwed with phosphated self-drilling screws with flat countersunk head, laid at staggered joints and with a distance of no more than 600mm for the first layer and no more than 250mm for the second layer.
The slabs will be laid in accordance with the procedures prescribed in the UNI 11424:2015 standard and subsequent amendments and additions.
The on-site supply will include the grouting of the joints, corners and screw heads as well as the grouting and sealing of the joints where the slabs are approached, carried out with suitable stucco after applying strips of support reinforced with textile mesh, the subsequent grouting of the surface of the slabs in order to obtain a surface ready for the finish chosen in the project.

The price includes and compensates the costs for the formation of provisional works for the safe execution of the works and subsequent disassembly, the temporary protection of floors and elements within the intervention area with the installation and final removal of special protective sheets, the supply and installation of insulation, the cutting and scrapping of the slabs, corner guards, the formation of door compartments complete with perimeter reinforcement in metal profiles for anchoring the window, the charges for the installation of frames for sliding doors inside the wall if provided for in the project, the burden of proceeding after the application of the slabs while waiting for the execution of electrical and thermo-hydraulic systems to be inserted, the charges for acoustic sealing at the system penetrations, the charges for acoustic certifications and testing, as well as compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

21.25. DW29 – Standard non-insulated plasterboard counterwall, 7.50cm thick

Supply and installation of standard non-insulated plasterboard counterwall type Knauf W626, total thickness of 7.50cm, with floor to slab development, composed as follows:
- external sheet in standard GKB plasterboard, th. 12.5 mm
- GKB standard plasterboard internal sheet, th. 12.5 mm
- single self-supporting metal frame, th. 50mm

50mm self-supporting metal frame, made of Knauf type profiles in galvanized steel with a yield strength of 300 N/mm², compliant with the European standard UNI EN 10346, with 1st choice zinc coating and 99% Zn quality, 0.6 steel thickness consisting of 40x50x40mm "U" guides; 50x50x50mm "C" uprights, inserted in the guides, with a 600mm spacing, insulated from the perimeter structures with double-sided closed-cell polyethylene foam tape, type Knauf K434 with acoustic cutting function, 3.5 mm thick and sealed with putty and/or silicone to completely fill the cracks at the perimeter joints with the primary structures, to achieve the required acoustic performance.
The guides will be constrained at the base and at the top of the slab by means of dowels suitable for the support placed at a distance of no more than 500mm.

The profiles will comply with the harmonized standard EN 14195 concerning "Profiles for Coated Gypsum Sheet Systems" with CE certificate of conformity, in class A1 of reaction to fire, produced according to the UNI-EN-ISO 9001-2000 quality system, with production certified by ICMQ.

The coating of the metal frame will consist as follows:
Double standard plasterboard sheet type Knauf GKB (A) in accordance with EN 520 – DIN 18180, with the following technical characteristics:

- Sheet thickness 12.5 mm
- Fire reaction class: A2-s1, d0 (B)
- Density: 680 kg/m3 approx.
- Thermal conductivity λ: 0.20 W/mK
- Water vapour permeability (EN 10465-2008): 10 dry - 4 wet
- Tested from a bio-housing point of view according to the certificate issued by the Institute of Bioarchitecture in Rosenheim

The slabs will be screwed with phosphated self-drilling screws with flat countersunk head, laid at staggered joints and with a distance of no more than 600mm for the first layer and no more than 250mm for the second layer.
The slabs will be laid in accordance with the procedures prescribed in the UNI 11424:2015 standard and subsequent amendments and additions.
The on-site supply will include the grouting of the joints, corners and screw heads as well as the grouting and sealing of the joints where the slabs are approached, carried out with suitable stucco after applying strips of support reinforced with textile mesh, the subsequent grouting of the surface of the slabs in order to obtain a surface ready for the finish chosen in the project.

The price includes and compensates the costs for the formation of provisional works for the safe execution of the works and subsequent disassembly, the temporary protection of floors and elements within the intervention area with the installation and final removal of special protective sheets, the supply and installation of insulation, the cutting and scrapping of the slabs, corner guards, the formation of door compartments complete with perimeter reinforcement in metal profiles for anchoring the window, the charges for the installation of frames for sliding doors inside the wall if provided for in the project, the burden of proceeding after the application of the slabs while waiting for the execution of electrical and thermo-hydraulic systems to be inserted, the charges for acoustic sealing at the system penetrations, the charges for acoustic certifications and testing, as well as compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

21.26. DW31 – Standard plasterboard interior partition wall, insulated, 10cm thick

Supply and installation of an internal partition wall in standard plasterboard type Knauf W112, with a total thickness of 10cm, development from slab to slab overall height H max = 7.50 meters, composed as follows:
- double sheet in standard GKB plasterboard, th. 12.5mm

- single self-supporting metal frame, th. 50mm
- insulating layer in glass wool, th. 40mm
- double sheet in standard GKB plasterboard, th. 12.5mm

The self-supporting metal frame with development from floor to slab, made with Knauf "E" series profiles in galvanized steel DX51D+ZN- A-C thickness 0.6mm in accordance with EN 14195 and UNI EN 10346, with 1st choice zinc coating and 99% Zn quality, CE marked, consisting of guides at the base "U" 40/50/40mm, th. 0.6mm; "C" uprights 50/50/50mm th. 0.6mm, inserted in the guides, placed at a distance of 400mm and insulated from the perimeter structures with Knauf single-sided adhesive vinyl tape with acoustic cutting function, 3.5mm thick and sealed with putty and/or silicone to completely fill the cracks at the perimeter joints with the primary structures, to achieve the required acoustic performance.
The guides will be constrained to the slab at the base and at the top by means of dowels suitable for the support placed at a distance of no more than 600mm.
The profiles will comply with the harmonized standard EN 14195 concerning "Profiles for Coated Gypsum Sheet Systems" with CE certificate of conformity, in class A1 of reaction to fire, produced according to the UNI-EN-ISO 9001-2000 quality system, with production certified by ICMQ

Filling of the cavity of the metal frame with a double panel type KNAUF INSULATION MINERAL WOOL 35 (λD 0.035 W/mK): glass mineral wool panel without coating suitable for thermal and acoustic insulation of partition walls, false walls.
The insulating panels will be inserted under pressure and continuously in the space between the uprights, laid at staggered joints, well placed together, taking care that they are not in any way compressed between the plasterboard sheets, but have an adequate thickness according to the air gap; provide for any fixing of the same to the uprights of the structure to ensure that the insulating panel remains in place.

<u>The coating of the metal frame will consist as follows:</u>
Double standard plasterboard sheet type Knauf GKB (A) in accordance with EN 520 – DIN 18180, with the following technical characteristics:

- Sheet thickness 12.5 mm
- Fire reaction class: A2-s1, d0 (B)
- Density: 680 kg/m3 approx.
- Thermal conductivity λ: 0.20 W/mK
- Water vapour permeability (EN 10465-2008): 10 dry - 4 wet
- Tested from a bio-housing point of view according to the certificate issued by the Institute of Bioarchitecture in Rosenheim

The slabs will be screwed with phosphated self-drilling screws with flat countersunk head, laid at staggered joints and with a distance of no more than 600mm for the first layer and no more than 250mm for the second layer.
The slabs will be laid in accordance with the procedures prescribed in the UNI 11424:2015 standard and subsequent amendments and additions.

The on-site supply will include the grouting of the joints, corners and screw heads as well as the grouting and sealing of the joints where the slabs are approached, carried out with suitable stucco after applying strips of support reinforced with textile mesh, the subsequent grouting of the surface of the slabs in order to obtain a surface ready for the finish chosen in the project.

The price includes and compensates the costs for the formation of provisional works for the execution of the work in safety, and subsequent dismantling, the temporary protection of floors and elements present within the intervention area with the laying and relative final removal of special protective sheets, the cost for the laying of the decoupling tape at the base and at the top of the substructure, for the cutting and scrapping of the slabs, the corner guards, the formation of door compartments complete with perimeter reinforcement in metal profiles for anchoring the window, the charges for the installation of the insulation, the frame for sliding doors inside the wall if provided for in the project, the structural reinforcement for the loads foreseen in the project, the burden of proceeding after the application of the slabs while waiting for the execution of electrical and thermo-hydraulic systems to be inserted, the charges for acoustic sealing at the plant penetrations, as well as compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

22. GLASS WORKS

22.1. Generality

The materials to be used in all glass works must correspond to the characteristics of the project, the regulations in force and the provisions provided by the works management.
The flat glass will be of the simple type, with thicknesses from 3 to 12mm (the thickness will be measured on the basis of the arithmetic mean of the thicknesses measured in the center of the four sides of the sheet) and tolerances indicated by the UNI standards.
Treated glass sheets will be considered flat cast and laminated glass with treatment of the external surfaces such as to make them parallel and perfectly shiny.
The safety windows will be divided, according to the standards indicated, into the following 4 classes:
1) simple safety, against sharp injuries and against falls into the void;
2) vandal-proof, resistant to the throwing of porphyry cubes;
3) anti-crime, divided into three subclasses, according to the resistance to the combined effect of various types of blows;
4) bulletproof, divided into simple and splinter-proof.

Raw crystals are defined as crystal sheets characterized by the absence of the final manufacturing process after casting and lamination and with irregular external faces, transparent to light only and with any ornamental motifs.
Laminated glass, consisting of tempered glass and glass, must meet the characteristics indicated by the aforementioned standards and will be composed of one or more sheets, of various thicknesses, separated by sheets of PVB (polyvinyl butyral) or similar, with final thicknesses >= 20mm, up to a maximum of 41mm in the case of bulletproof glass.
All the slabs must be transported and stored in a vertical position, in particular, for coupled slabs, it must be provided in such a way that the support surfaces are always orthogonal to each other so as not to introduce abnormal stresses on the sealing joints.
In the supply and installation, the Contractor is required to use all the necessary precautions (elastic supports, rebate depth, etc.) to prevent deformation, vibrations or installation defects.
The sealants used will be resistant to ultraviolet rays, water and heat (up to 80° C.) and comply with the characteristics required by the manufacturers of the glass sheets, normal or laminated, to which they will be applied.
Elastomeric sealants must be used for the sealing of stratified or air chamber sheets, while the use of oil-based sealants or solvents is prohibited.
The installation of the glass sheets will include any type of cut to be carried out in the factory or on site and the grinding of the edges which, in the case of large sheets, must always be carried out before installation.
During the installation and tightening of the glass panes, all the precautions provided for thermal expansion or any structural and external stresses must be observed and respected.
All the above provisions, in addition to any special specifications, are also valid for works with structural glass elements (U-profiles), for glass block structures, skylights, special roofs, etc.
The specific characteristics of some types of glass works are shown in the following list:
1) acoustic insulating glass units made in fixed sizes consisting of two crystals with a thickness of mm. 4, thermal transmission coefficients "k=3.00-3.40 watt/m°C" with butyl or metal spacer, welded around the perimeter with polysulphides and a cavity of 6-9-12 mm.

2) stratified "Visarm" type safety crystals composed of two crystals joined together with a perfectly transparent polyvinyl butyral plastic sheet in thicknesses 6/7, 8/9, 10/11, 11/12, 19/21;
3) stratified "Blindovis" type safety crystals composed of three crystals joined together by two sheets of perfectly transparent polyvinyl butyral plastic in thicknesses 18/19, 26/27, 36/38;
4) extruded polymethylmethacrylate sheets with a thickness of mm. 3 and with excellent transparency characteristics to be inserted on windows, wooden or metal frames with the use of suitable gaskets, sealants and silicone-based adhesives to ensure a perfect external seal.

22.2. Reference standards

- UNI 7697: 2021 Safety criteria in glass applications
- UNI 11678:2017 Glass for building - Glass curtain walls with fall arrest function - Resistance to linear static load and dynamic load - Test methods
- UNI 11463:2022 Glass for building - Determination of the load-bearing capacity of flat glass sheets applied as elements with a filling function - Calculation procedure

23. INTERNAL GLASS PARTITIONS

23.1. Generality

The internal glazed partitions must be designed to contain over time wiring, accessories of electrical, telephone and computer systems, compatible with the service equipment required in the project.
The technical characteristics, materials and finishes of the newly supplied walls made of double-pane safety glass plus acoustic PVB or opaque with finishes defined by the project, as well as the glazed/opaque doors that are part of the system, must be subjected to sampling and approval by the D.L.

23.2. Method of execution of the glass wall

Tracking
Ceiling and floor tracing is performed for the positioning of profiles.
The system will be built according to tailor-made modules for each section, so as to divide each section into identical modules, reducing the adjustment elements to the building which will have to be standardized and reduced in size so as not to alter the overall aesthetics of the wall.
Including extruded aluminium profile/frame on the two visible faces of the plasterboard veil/partition above the glazed movable partitions.
The self-supporting structure consisting of an upper, lower and lateral wall profile in extruded primary aluminium alloy: structure designed to receive the glazed infill elements flush with the outside of the profile with interlocking fixing without glue or structural double-sided adhesive and leveller/compensator designed to absorb structural settlement or seismic stress.
Positioning of the flat glazed infill elements, of the type specified in the project.
The system will allow two- and three-way glazed connections, and the connection between glass and the traditional partition plasterboard wall system will also have to be provided.
The system must accommodate double-pane or single-pane glass doors, hinged or sliding according to the design dimensions.

23.3. Reference standards

- UNI 10700:1999 Internal partitions - Movable internal walls - Terminology and classification
- UNI 10820:1999 Internal partitions - Movable internal walls - Requirements analysis
- UNI 10815:1999 Movable internal walls - Equipability for technical systems - General criteria
- UNI 10816:1999: Movable interior walls - Equipability with service equipment - General criteria
- UNI 10817:1999 Movable internal walls - Earthing connections - Requirements and verification
- UNI 11004:2002 Internal partitions - Movable internal walls - Significant types for the determination of soundproofing power
- UNI 10879:2000 Movable internal walls - Resistance test to suspended and horizontal loads
- UNI 10880:2000 Movable internal walls - Requirements and test methods for fall resistance - Resistance to linear static load and dynamic load - Test methods
- UNI 11463:2022 Glass for building - Determination of the load-bearing capacity of flat glass sheets applied as elements with a filling function - Calculation procedure

- UNI EN ISO 717-1:2021 Acoustics – Evaluation of sound insulation in buildings and building elements – Part 1: Airborne sound insulation
- UNI EN ISO 10140-2:2021 Acoustics – Laboratory measurement of sound insulation of buildings and building elements – Part 2: Measurement of airborne sound insulation

23.4. Acceptance Requirements

All profiles must be made of extruded aluminium 6060 according to the following standards:

- UNI EN 573-3:2022 Aluminium and aluminium alloys – Chemical composition and shape of semi-finished products – Part 3: Chemical composition and shape of products

The profiles will have straight sections with dimensions 36x40mm.
The finish of all aluminium profiles to be defined, at the choice of the D.L., to be sampled for approval.
Glazed curtain walls in double transparent glass (66.2) mm 6+6+ 0.76 PVB of acoustic type, with a total thickness of 12.76 mm
Wall acoustic performance: **Rw minimum 40dB CERTIFIED BY ACCREDITED LABORATORY**.
Acoustic performance of the wall system + hinged door **Rw minimum 38dB CERTIFIED BY ACCREDITED LABORATORY**
All the movable partitions, which can be entirely dismantled and reassembled in other places, will be made with modular elements.
All elements must be easily maintainable and it must be possible to replace parts in the future without having to disassemble adjacent elements.
In this sense, all fastenings must be done quickly, using mechanical devices integrated into the components, thus limiting the use of screws and bolts. The wall will be built according to tailor-made modules for each section, so as to divide each section into identical modules, reducing the adjustment elements to the building which will have to be standardized and reduced in size so as not to alter the overall aesthetics of the wall.
Vertical profiles will only be present in wall-mounted modules.

23.5. Performance Specifications

Glazed movable wall: metal structure/glazed infill elements/sealing, see product data sheet.

23.6. Sampling/testing methods

It is prescribed that all materials must correspond in characteristics to the provisions of the official rules and regulations in force on the subject.
All profiles must be made of extruded aluminium in a high-strength alloy as required by current standard.
The finish of all profiles is provided with epoxy-polyester powder coating or alternatively natural anodized aluminum finish, to be defined and sampled for approval by the D.L.
The glass curtain walls are made of safety glass, plus acoustic PVB.
Acoustic performance of the wall CERTIFIED BY AN ACCREDITED LABORATORY.
Opaque curtain walls with finish as required by the project and with acoustic performance of the wall CERTIFIED BY AN ACCREDITED LABORATORY.

All the movable partitions, which can be entirely dismantled and reassembled in other places, will be made with modular elements. All elements must be easily maintainable and it must be possible to replace parts in the future without having to disassemble adjacent elements.

23.7. Tests

The Works Management reserves the right to have its appointees carry out checks and tests on the supplies covered by the contract in order to ascertain compliance with the required quality requirements.

23.8. Guarantees

The provisions of the General Conditions of Contract, with the following clarifications, apply.
The warranty will be for years specified by the supplier and valid from the date of final testing.

23.9. Structural reinforcement of false ceiling for installation of glass partitions

Supply and installation of structural reinforcement on false ceilings suitable for guaranteeing the fixing of glass partitions and doors inserted in them, duly sized and statically verified by the supplier in accordance with current standards and submitted to the approval of D.L.

23.10. CW05 – Double-pane glass movable wall type Vetroin Lightwall LW2 model

Supply and installation of a system of self-supporting internal glass walls type Vetroin model Lightwall LW2 to be submitted to the approval of the D.L., double slab, highly soundproofing, with development from finished floor to false ceiling/acoustic septum/floor, H 320cm, see project drawings, made according to a tailor-made form for any section, so as to divide each section according to identical modules, reducing the adjustment elements to the property which will have to be standardized and reduced in size so as not to alter the overall aesthetics of the wall.
The self-supporting structure consists of an upper, lower and lateral wall profile in extruded painted 6060 UNI 9006/1 primary aluminium alloy, a structure designed to receive the glazed infill elements flush with the outside of the profile with interlocking fixing without glue or structural double-sided adhesive and leveller/compensator designed to absorb structural settlements or seismic stresses.
Profile dimensions 75 x H 40mm.
The finish of all aluminium profiles is provided chemical anodized RAL 7046 colour to be sampled for approval by D.L.
The floor and ceiling guides and the wall profiles must allow the perfect total adjustment of ± 20mm of the wall and the perfect closure against the wall facings.
The size of the profile will be constant both on the ceiling and on the floor and vertical on the wall, even when the design dimensions vary within the product tolerances of ±15mm.
The profiles must offer the possibility of housing a double-slab glazed infill system, coplanar with the profile to form a cavity.
All potentially dangerous profiles must have suitable sections so as not to constitute a risk of cutting or bruising.

The flat glazed infill elements will consist of two 6.6.1 transparent laminated glass (6mm glass + 0.38mm thick PVB + 6mm glass).
Acoustic performance of the glass wall + hinged door **system Rw to be defined**.

Acoustic performance of the wall system without door **Rw to be defined.**
The gaskets will be made of plastic material (completely non-toxic) to allow the best acoustic performance and perfect sealing and will not contain PVC.
The sealing of the glass, inside the containment profiles, is ensured by soft gaskets in polyurethane foam.
The junction between glazed and blind elements, linear or angular, fixed or variable, is guaranteed by transparent polycarbonate profiles.
The system will allow two- and three-way glazed connections, and the connection between glass and the traditional partition plasterboard wall system will also have to be provided.
The system must accommodate double-pane or single-pane glass doors, hinged or sliding according to the design dimensions.
The doors will be coplanar with the jamb and the wall.

Including supply and application of privacy film on the internal side of the system, type and model to be defined and sampled for approval by the D.L.

The price includes and compensates the costs for surveying, positioning drawings to be submitted to the approval of the D.L., the mock-up of the system, transport, installation according to the design of the project, the sealing between the window and the building context, the suitable complete sampling of accessories that the Contractor must present before the start of the works, the sizing to be carried out by the Contractor, in compliance with the safety standards with regard to static loads according to NTC 2018, the verification and any additional work in compliance with the anti-seismic standards, compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

23.11. GD02 - Double-glazed single-hinged doors on glass movable walls, dimensions 90x210cm

Supply and installation of a single swing door identical in technology to the double-glazed mobile wall system described above, type Vetroin Lightwall LW2 model, mounted on a glass movable wall, consisting of:
Jamb and crosspiece in extruded aluminium profiles, finish like that of the newly supplied movable walls.
Thickness of the profile like that of the movable walls where installed.
Framed doors with aluminium perimeter profile, equipped with double rebate and equipped with gaskets on all rebate sides.
Sash flush with the outer edge of the wall.
The rotation system is anchored to the subframe and is composed of aluminum supports and steel rotation pins.
Double-pane glass mirror composed of extra-clear tempered safety glass, the PVB film interposed between the sheets (with safety function) must be of the "acoustic" type in order to contribute to the improvement of the acoustic performance of the product.
Sound sealing system at the bottom and top of the door (acoustic guillotine)
Steel floor door stoppers to be sampled for approval by D.L.

90° opening lock
Model handle to be defined and sampled for approval by the D.L.

Port size:
- GD02: 90x210cm including fanlight to reach H 320cm of the glass movable wall.

The price includes and compensates for the costs for taking measurements, transport, installation, sealing between the window and the building context, the appropriate complete sampling of accessories that the Contractor must present before the start of the works, compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

24. INSTALLATION OF COUNTERFRAMES

24.1. Generality

The classification of the windows and doors can be found in the drawings.

Welding

It will be governed by the Technical Standards concerning the execution and use of welding contained in the Ministerial Decree of 27/07/85. If required, the welds must be continuous, chamfering the adjacent edges and filling them with welding.
Electrodes and methods of use will be those recommended by the manufacturers for each type of steel and the flux must be completely removed immediately after welding. The joints will be suitably prepared on the exposed and contact parts and the flux must be completely removed immediately after welding.

Galvanizing for counterframes, frames and products

The procedure for galvanizing counterframes, frames and products made of press-bent steel sheet or with box profiles will follow the UNI EN ISO 1461:2009 standard. The average weight of the zinc layer will not be less than 0.275 Kg/sqm (Sendzimir process).
In the sections of welding that may be carried out for particular and justified reasons on site, the same and the immediately adjacent parts must be protected with appropriate inorganic zinc paint. The use of black iron will not be allowed.

Material processing

The processing of the materials must be done with regularity of shapes and exact dimensions; The holes must be drilled exclusively with a drill.
Sheet metal cuts can be made with shears; however, all visible cuts will have to be finished with a grinding wheel.
The parts that will have to be assembled will be cleaned beforehand and spread with anti-rust on the matching surfaces, if made with non-pre-painted sheets or profiles.
Patches or welds to repair breakages or mask processing or installation defects will not be accepted.

Construction features

Unless otherwise specified, the counterframes must be assembled in buildings and sent to the construction site as complete units.

Unless otherwise specified on the attached project drawings, the following applies:
The elements constituting the frames or in any case constituting elements of load-bearing or structural parts will be made with profiles with a minimum thickness of 10/10 mm. The secondary connecting elements or in any case not constituting elements of load-bearing or structural parts will be made with sheets or profiles with a minimum thickness of 8/10 mm.

Frames and counterframes must be supplied on site in time to be installed at the same time as the execution of the masonry or in the case of the restoration and squaring of existing rooms. The supply of special templates built in the workshop in order to ensure that the required dimensions of the

compartments are respected with absolute precision, where it is not necessary to anchor the frames directly in the masonry.
The counterframe must be secured to the masonry work, by means of steel pins K700/diam.18, inserted in the masonry for a minimum of 20 cm and at least 3 on each side, this for heights up to 220 m. For higher heights, pins will need to be added according to the resulting wheelbase from the primary height.
The holes in the masonry must be made as per the project scheme and, in any case, with special mechanical means without demolition works.
The hole must be inclined, both as a horizontal section and as a vertical section. The inclination must be such as to prevent the chemical cement, the fixing agent, from draining out.

24.2. Method of execution

The installation of the counterframes will take place according to precise executive details provided by the company supplying the windows and doors.
The supplier of the counterframes together with the company that will carry out the installation of the same, must coordinate in order to verify their correct installation.

24.3. Reference legislation

Legislation relating to metallic materials

- Regulations relating to hot-dip galvanizing
- UNI 5681:1973 Hot-rolled finished steel products. T-profiles with sharp edges. Dimensions and tolerances
- UNI EN 10346:2015 Continuous hot-dip coated flat steel products for cold forming – Technical supply conditions
- UNI EN 10143:2006 Thin sheets and strips of steel with continuous hot dip coating – Tolerances on size and shape
- UNI EN 10088-2:2014 Stainless steels – part 2: Technical conditions for the supply of general purpose corrosion-resistant steel sheets, sheets and strips
- UNI 6762:1970 Hot-rolled steel profiles. L-shaped profiles with sharp edges and unequal sides. Dimensions and tolerances
- UNI 6763:1970 Hot-rolled steel profiles. Z-profiles with sharp edges and unequal bases. Dimensions and tolerances

24.4. Acceptance Requirements, Sampling/Testing Methods

The contractor must submit the technical sheet to the Works Management, of the material he intends to use. Only after the authorization of the Works Management will it be able to proceed with the planned works.
The frame must be fixed to the subframe by stainless steel screws, self-tapping and drilling, equipped with a suitable rubber or plastic gasket, with a maximum distance of 40 cm.
The frame of the window must be equipped with special adjustable spacers.

Before proceeding with the execution of the works, the supplier of the fixtures must submit to the Works Management a sample of each type of counterframe to be laid for validation and acceptance of the same.
For the acceptance of the supply, the counterframes must not show any deformation.
The Works Supervision and the Inspector reserve the right to have samples taken of materials to be tested according to the regulations.
The costs relating to the execution of the above tests will be borne by the Contractor.

24.5. Tests

When the work is completed, provisional and final tests will be carried out.
The correspondence of the works carried out to the project and the correspondence of the materials used to those provided for in this technical specification and in the executive drawings will be ascertained.
Checks will be carried out on correct assembly, coplanarity and matching with the thresholds and jambs, water tightness, verticality, etc.
Supervisor's obligations and obligations
The supply of the counterframes is the responsibility of the company supplying the fixtures.
The installation of the counterframes complete with anchors, made of galvanized steel, will be carried out by General Construction.

25. WINDOWS

25.1. Generality

In compliance with Presidential Decree no. 59 of 2 April 2009, the glass must have a solar factor g=0.35 lower than g (lim)=0.50 (UNI EN 410:2011) in charge of reducing internal radiation in the absence of external shading systems, with a thermal transmittance of the glass surface U=1,600 W/m2K, and a thermal transmittance including windows U=1,913 W/m2K (with closed closure).
The finishing of the accessories will be coordinated with that of the frames according to sampling approved by the Works Management or by the Client.
All the components of the project windows and doors (metal frames, accessories, glazing, gaskets, sealants, screens, others) must be made of materials that do not release hazardous substances beyond the maximum admissible level established by the European regulations on materials or by the relevant national regulations.

25.2. Façade performance

They will refer to the following laboratory test methodologies and related classifications according to European legislation:

- Curtain walls - Air permeability - Performance requirements and classification according to UNI EN 12152:2003. This European Standard specifies the requirements and classification according to the air permeability of fixed and openable parts of curtain walls under positive and negative static air pressure.
- Water tightness, classification according to UNI EN 12154:2014
- Curtain walls - Resistance to wind load - Performance requirements, classification according to UNI EN 13116:2002. This European Standard specifies the requirements relating to the structural performance of curtain walls subjected to wind load, both in their fixed and openable parts, under positive and negative static air pressure.
- Glass for building – Pendulum test – Impact test method and classification for flat glass, classification according to UNI EN 12600:2004. This document specifies a method for the pendulum impact test of individual sheets of flat glass for use in construction. The test aims to classify flat glass into three main classes depending on its performance against impact and the mode of breakage.
- Pedestrian doors, window frames, curtain walls, railings and blackout closures - Burglary resistance - Requirements and classification, classification according to UNI EN 1627:2021. It applies to the following types of openings: rotational, tilting, folding, rotating, suspended at the top or bottom, sliding (horizontally or vertically) and rolling, as well as fixed structures. The standard does not apply to attempts to manipulate and break into electronic or electromagnetic security devices.

As far as acoustic performance is concerned, the necessary soundproofing power value must be determined according to the intended use of the adjacent rooms and the performance of the other

materials making up the external walls, on the basis of the provisions of the D.P.C.M. decree of 5/12/97 on the passive requirements of buildings.
At the time of supply, the window manufacturer must document and certify the performance of the fixtures as well as the laboratories and methodologies used for the checks. In particular, the overall thermal transmittance must guarantee the provisions of the Lombardy Regional Decree No. VIII/008745/2008 and subsequent amendments and additions and Interministerial Decree of 26 June 2015 - Adaptation of national guidelines for the energy certification of buildings

All the components of the project windows and doors (metal frames, accessories, glazing, gaskets, sealants, screens, others) must be made of materials that do not release hazardous substances beyond the maximum admissible level established by the European regulations on materials or by the relevant national regulations.

25.3. Glazing

The glazing of the windows and doors (flat, curved, float, laminated, reinforced, tempered type) must comply with the reference standards described below.
Thickness of flat glass for glazing according to its size, wind action and snow load using the design wind or snow load calculated with the methodology indicated by Circular 4 July 1996 n° 156AA. GG. STC Instructions for the application of the technical standards relating to the "general criteria for the verification of the safety of constructions and loads and overloads" referred to in the Ministerial Decree of 16 January 1996.

25.4. Metal windows and doors

Metal windows and doors (windows, fixed lights, French doors, doors) and screens must be in accordance with the standards listed below.
The accessories must be made of materials resistant to atmospheric corrosion and have characteristics such as to give the window the mechanical resistance, stability and functionality for the conditions of use and stress for which it is intended.
The materials constituting the accessories must be compatible with those of the surfaces with which they are in contact.
The connection of the profiles, between the external and internal walls, must be made continuously and definitively, by means of strips in thermally insulating synthetic material (Polythermid or polyamide).
The performance of the system must be documented by certification issued by authorized laboratories. In any case, the performance must not be lower than the minimum references provided for by national legislation.

25.5. Aluminium windows and doors

The construction of the frames of the windows and doors must be carried out with the use of extruded profiles in aluminum alloy 6060 compliant with the standard:

- UNI EN 573-3:2022 Aluminium and aluminium alloys – Chemical composition and shape of semi-finished products – Part 3: Chemical composition and shape of products

With the tolerances provided for by the standard:

- UNI EN 12020-1:2022 Aluminium and aluminium alloys – Extruded precision profiles in EN AW-6060 and EN AW-6063 alloys – Part 1: Technical control and supply conditions
- EN 12020-2:2023 Aluminium and aluminium alloys – Extruded precision profiles made of EN AW-6060 and EN AW-6063 alloys – Part 2: Dimensional and shape tolerances

Other aluminium alloys from plastic processing may also be accepted as long as they have the same properties as alloy 6060.
It is necessary that the frames of aluminium or aluminium alloy windows and doors with thermal break comply with the standard:

- UNI EN 14024:2005 Metal profiles with thermal break – Mechanical performance – Requirements, verifications and tests for evaluation

For applications that require the use of rolled products, drawn or non-extruded aluminium shapes, the use of materials that comply with the following standards is required:

- UNI EN 573-3:2022 Aluminium and aluminium alloys – Chemical composition and shape of semi-finished products – Part 3: Chemical composition and shape of products
- UNI EN 485-1:2016 Aluminium and aluminium alloys - Sheets, strips and plates – Part 1: Technical control and supply conditions
- UNI EN 485-2:2018 Aluminium and aluminium alloys - Sheets, strips and plates – Part 2: Mechanical characteristics
- UNI EN 485-3:2005 Aluminium and aluminium alloys - Plates, strips and plates – Part 3: Dimensional and shape tolerances of hot-rolled products
- UNI EN 485-4:1996 Aluminium and aluminium alloys - Sheets, strips and plates. Dimensional and shape tolerances of cold-rolled products
- UNI EN 754-2:2017 Aluminium and aluminium alloys - Cold-drawn bars and tubes – Part 2: Mechanical characteristics

Also in this case, other aluminum alloys from plastic processing may be accepted as long as they possess the same properties as the aforementioned standards.
For applications that require the use of aluminium castings, the use of materials complying with the following standard is required:

- UNI EN 1706:2021 Aluminium and aluminium alloys - Castings - Chemical composition and mechanical properties

The painting must have the properties required by the standard:

- UNI EN 12206-1:2021 Paints and varnishes – Coatings of aluminium and aluminium alloys for architectural applications – Part 1: Coatings prepared from powdered thermosetting materials

The thickness of the paint film must be suitable for the type of coating product chosen (liquid, powder) and the application technology (continuous on tape, spray) in accordance with the provisions of the standard:

- UNI 3952:1998 Aluminium and aluminium alloys - Aluminium windows and doors and aluminium alloys for building - Standards for the choice, use and testing of materials

Anodic oxidation must have the properties required by the standard:

- UNI 10681:2010 Aluminium and aluminium alloys - General characteristics of anodic oxide layers for decorative and protective use

For this type of surface finish, the layer class must also be specified, depending on the use, among those provided for by the above-mentioned UNI 3952:1998.

25.6. Wooden windows and doors

Fixtures, such as doors, windows, glazing, roller covers and the like, will be measured from a single side on the external perimeter of the frames, whether they are simple or coffers, without taking into account the paws to be recessed into the floors or thresholds. The ribbed parts will be evaluated according to the surface of the minimum circumscribed rectangle, with the frame closed, included as above the main frame, if any. The price of the fixtures includes exhibitions and counter-exhibitions.
The thicknesses indicated in the various items of the tariff are those that must be shown when the work is completed.
All fixtures must always be equipped with support and closing hardware, wall sprinkles, handles and any other accessory necessary for their proper functioning. They must also correspond in every detail to the samples approved by the Works Management.
The prices listed include the supply of the window and related accessories mentioned above, the cost of unloading and transport to the individual rooms of destination and installation.
The wood used must be well seasoned, free from knots or other defects; The boards will be made from straight beams and resinous essences will have to be used for external windows.
The glued and jointed laminated woods of first choice will be with three blades for transparent varnish while for opaque paints all the lamellas are finger-jointed
Residual wood moisture control carried out in the factory.
All the wood used must be certified with the FSC Certified (Forest Stewardship Council) mark, which certifies that it comes from responsibly managed and regenerated forests with environmental sustainability criteria. The processes must guarantee the quality and thicknesses indicated by the projects with tolerances of +/- 0.5mm. thickness is +/- 2mm. on the width and length.

25.7. Reference legislation

- UNI EN 1026:2016 Windows and doors – Air permeability – Test method
- UNI EN 1027:2016 Windows and doors – Water tightness – Test method
- UNI 10818:2015 Windows, French doors, doors and blackout closures - Roles, responsibilities and contractual indications in the installation process
- UNI EN ISO 10077-1:2018 Thermal performance of windows, doors and shutters – Calculation of thematic transmittance – Part 1: General
- UNI EN ISO 10077-2:2018 Thermal performance of windows, doors and shutters – Calculation of thematic transmittance – Part 2: Numerical method for frames
- UNI 11173:2015 External windows and curtain walls – Criteria for choosing the performance characteristics of air permeability, water tightness and resistance to wind load

- UNI 11673-1:2017 Installation of windows and doors – Part 1: Requirements and design verification criteria
- UNI 11673-2:2019 Installation of windows and doors – Part 2: Requirements of knowledge, skills and competence of the window installer
- UNI 11673-3:2019 Installation of windows and doors – Part 3: Minimum requirements for the provision of non-formal education and training courses for window and door installers
- UNI 11673-4:2021 Installation of windows and doors – Part 4: Requirements and criteria for verifying execution
- UNI EN 12207:2017: Windows and doors - Air permeability – Classification
- UNI EN 12208:2000 Windows and doors - Water tightness - Classification
- UNI EN 12210:2016 Windows and doors - Resistance to wind load – Classification
- UNI EN 12211:2016 Windows and doors – Resistance to wind load – Test method
- UNI EN ISO 12567-1:2010 Thermal insulation of windows and doors – Determination of thermal transmittance by the hot chamber method – Part 1: Complete windows and doors
- UNI EN ISO 12567-2:2006 Thermal insulation of windows and doors – Determination of thermal transmittance by the hot chamber method – Part 2: Roof windows and other protruding windows
- UNI EN 14351-1:2016 Windows and doors - Product standard, performance characteristics - Part 1: Pedestrian windows and external doors
- UNI EN 14351-2:2018 Windows and doors - Product standard, performance characteristics - Part 2: Pedestrian windows and interior doors
- UNI EN 14220:2007: Wood and wood-based materials in external windows and in external door sashes and frames - Requirements and specifications
- UNI EN 16034:2014 Pedestrian doors, industrial, commercial, garage doors and opening windows – Product standard, performance characteristics – Fire resistance and/or smoke control characteristics
- UNI EN 1634-1:2018 Fire resistance and smoke dispersion control tests for doors and closing systems, opening windows and their construction accessories – Part 1: Fire resistance tests for doors and closing systems and opening windows
- UNI EN 16361:2016 Motorized pedestrian doors - Product standard, performance characteristics - Pedestrian doors, other than hinged doors, initially designed for motorized installation
- UNI EN 15651-1:2017 Sealants for joints for non-structural use in buildings and pedestrian walkways - Part 1: Sealants for façade elements
- UNI EN 15651-2:2017 Joint sealants for non-structural use in buildings and pedestrian walkways - Part 2: Glazing sealants

- UNI EN 15651-3:2017 Joint sealants for non-structural use in buildings and pedestrian walkways - Part 3: Joint sealants for sanitary uses
- UNI EN 1906:2012 Accessories for windows and doors – Handles and knobs – Requirements and test methods
- UNI EN 16005:2012 Motorized pedestrian doors - Safety in use - Requirements and test methods

Main reference standards for soda-lime silicate glass:

- UNI EN 572-1:2016 Glass for building - Products based on soda-lime silicate glass – Part 1: Definitions and general physical and mechanical properties
- UNI EN 572-2:2012 Building glass - Basic products of soda-lime silicate glass - Part 2: Float glass
- UNI EN 572-4:2012 Glass for building - Products based on soda-lime silicate glass – Part 4: Drawn glass
- UNI EN 572-5:2012: Building glass - Basic products of soda-lime silicate glass - Part 5: Printed glass
- UNI EN 572-1:2016 Glass for building - Products based on soda-lime silicate glass – Part 1: Definitions and general physical and mechanical properties

Main reference standards for insulating glass:

- UNI 11678:2017 Glass for building - Glass curtain walls with fall arrest function - Resistance to linear static load and dynamic load - Test methods
- UNI 11463:2022 Glass for building - Determination of the load-bearing capacity of flat glass sheets applied as elements with a filling function - Calculation procedure
- UNI EN 15434:2010 Glass for building – Product standard for structural and/or UV-resistant sealant (for use in sealed structural glazing and/or insulating glass with exposed sealant)
- UNI EN 13022-1:2014 Building glass - Sealed structural glazing - Part 1: Glass products for sealed structural glazing systems, for supported and unsupported, monolithic and multiple glazing
- UNI EN 13022-2:2014 Building glass - Sealed structural glazing - Part 2: Installation rules
- UNI EN 1279-1:2018 Glass for construction – Insulating glass units – Part 1: General, description of the system, rules for replacement, tolerances and visual quality
- UNI EN 1279-2:2018 Glass for building – Insulating glass units – Part 2: Method for the aging test and requirements for water vapor penetration
- UNI EN 1279-3:2018 Glass for building – Insulating glass units – Part 3: Aging tests and requirements for gas leakage rate and gas concentration tolerances

- UNI EN 1279-4:2018 Building glass – Insulating glass units – Part 4: Test method for the physical properties of edge seals and inserts

Main reference standards for laminated glass and laminated safety glass:

- UNI EN ISO 12543-1:2022 Glass for building – Laminated glass and laminated safety glass – Part 1: Definition and description of component parts
- UNI EN ISO 12543-2:2022 Building glass – Laminated glass and laminated safety glass – Part 2: Laminated safety glass
- UNI EN ISO 12543-3:2022 Building glass - Laminated glass and laminated safety glass – Part 3: Laminated glass
- UNI EN ISO 12543-4:2022 Building glass - Laminated glass and laminated safety glass – Part 4: Test methods for durability
- UNI EN ISO 12543-5:2022 Building glass - Laminated glass and laminated safety glass – Part 5: Edge dimensions and finish
- UNI EN ISO 12543-6:2022 Building glass - Laminated glass and laminated safety glass – Part 6: Appearance
- UNI EN 14449:2005 Building glass - Laminated glass and laminated safety glass - Conformity assessment/Product standard
- UNI EN 15683-1:2013 Building glass - Thermally toughened profiled soda-lime silicate safety glass – Part 1: Definition and description
- UNI EN 15683-2:2014 Building glass - Thermally toughened profiled soda-lime silicate safety glass – Part 2: Conformity assessment/Product standard
- UNI EN 572-2:2012 Building glass - Basic products of soda-lime silicate glass - Part 2: Float glass
- UNI EN 572-5:2012: Building glass - Basic products of soda-lime silicate glass - Part 5: Printed glass

Main reference standards for reinforced glass:

- UNI EN 572-3:2012 Building glass - Products based on soda-lime silicate glass – Part 3: Reinforced glazed glass
- UNI EN 572-6:2012 Building glass - Products based on soda-lime silicate glass – Part 6: Reinforced printed glass
- UNI EN 572-7:2012 Building glass - Products based on soda-lime silicate glass – Part 7: Reinforced and non-reinforced profiled glass
- UNI EN 15683-2:2014 Building glass - Thermally toughened profiled soda-lime silicate safety glass – Part 2: Conformity assessment/Product standard

- UNI EN 15682-1:2013 Building glass - Thermally toughened alkaline silicate safety glass subjected to heat soak test - Part 1: Definition and description
- UNI EN 15682-2:2013 Building glass - Thermally toughened alkaline silicate safety glass subjected to heat soak test - Part 2: Conformity assessment/Product standard
- UNI 11666:2017: Glass for building - Painted glass for outdoor use - Aesthetic, durability, mechanical requirements and test methods

Main reference standards for special glass:
- UNI 1096-1:2012 Glass for building - Coated glass – Part 1: Definitions and classification
- UNI EN 1096-2:2012 Glass for building - Coated glass - Part 2: Requirements and test methods for class A, B and S coatings
- UNI EN 1096-3:2012 Glass for building - Coated glass - Part 3: Requirements and test methods for class C and D coatings

25.8. Seals

The gaskets inserted in the windows and doors must guarantee the expected performance (water tightness, air permeability, sound insulation), be compatible with the materials with which they come into contact and comply with the reference standards for the specific constituent material. The seals of the opening joints must be easily replaceable.

Main reference standards for window and door seals:
- UNI EN 12365-1:2005 Accessories for windows and doors – Seals for doors, windows, shutters and curtain walls – Part 1: Performance requirements and classification
- UNI EN 12365-2:2005 Accessories for windows and doors – Gaskets for doors, windows, blinds and curtain walls – Part 2: Test methods for determining compressive strength
- UNI EN 12365-3:2005 Accessories for windows and doors – Gaskets for doors, windows, blind closures and curtain walls – Part 3: Test method for determining elastic recovery
- UNI EN 12365-4:2005 Accessories for windows and doors – Gaskets for doors, windows, shutters and curtain walls – Part 4: Test method for determining recovery after accelerated aging

25.9. Sealants

The sealants used must guarantee the performance of watertightness, airtightness, dust tightness and the creation of long-lasting elastic continuity between two moving supports, be compatible with the materials with which they come into contact and comply with the reference standards for the specific material used.

Main reference standards for sealants:
- UNI EN ISO 6927:2021 Sealants for buildings and civil engineering works - Vocabulary

- UNI EN ISO 7389:2004 Construction – Products for joints – Determination of the elastic recovery of sealants
- UNI EN ISO 7390:2004 Construction – Products for joints – Determination of the creep resistance of sealants
- UNI EN ISO 8339:2006 Building Constructions – Sealants – Determination of Tensile Properties (Extension at Break)
- UNI EN ISO 8340:2006 Building Constructions - Sealants - Determination of tensile properties in the presence of prolonged traction over time
- UNI EN ISO 8394-1:2010 Construction – Sealants – Part 1: Determination of the extrudability of sealants
- UNI EN ISO 8394-2:2017 Construction and engineering works – Sealants – Determination of the extrudability of sealants – Part 2: use of standardised equipment
- UNI EN ISO 11600:2011 Construction – Products for joints – Classification and requirements for sealants

25.10. Handling accessories

The handling accessories will be the original ones of the system and must be chosen according to the indications given in the manufacturer's technical documentation according to the size and weight of the sash and the performance characteristics of the windows.

Main reference standards for door and window accessories:

- UNI EN 13126-1:2022 Accessories for windows and doors – Accessories for windows and French doors – Requirements and test methods – Part 1: Common requirements for all types of accessories
- UNI EN 13126-2:2021 Accessories for windows and doors – Requirements and test methods for windows and French doors – Part 2: Tavellini
- UNI EN 13126-4:2022 Accessories for windows and doors – Requirements and test methods for windows and French doors – Part 4: Cremonesi
- UNI EN 13126-13:2022 Accessories for windows and doors – Accessories for windows and French doors – Requirements and test methods – Part 13: Up and down balancing devices
- UNI EN 13126-14:2022 Accessories for windows and doors – Accessories for windows and French doors – Requirements and test methods – Part 14: Cam closures
- UNI EN 13126-16:2022 Accessories for windows and doors – Requirements and test methods for windows and French doors – Part 16: Accessories for lift-and-slide doors
- UNI EN 13126-17:2019 Accessories for windows and doors – Requirements and test methods for windows and French doors – Part 17: Accessories for sliding bottom-hung doors

- UNI EN 13126-19:2011 Accessories for windows and doors – Requirements and test methods for windows and French doors – Part 19: Closing devices for sliding doors
- UNI EN 1191:2013 Windows and doors – Resistance to repeated opening and closing cycles – Test method
- UNI EN 1935:2004 Accessories for windows and doors – Single axis hinges – Requirements and test methods
- UNI EN 12051:2001 Accessories for windows and doors - Deadbolts for doors and windows - Requirements and test methods
- UNI EN 1670:2007 Accessories for windows and doors – Corrosion resistance – Requirements and test methods
- UNI EN 1906:2012 Accessories for windows and doors – handles and knobs – Requirements and test methods

25.11. Safety of use

In order not to cause physical damage or injury to users, windows and doors must be designed in such a way that there are no sharp parts and abrasive surfaces that could injure users under normal conditions of use and stress or even maintenance workers.
They must also withstand false manoeuvres but possible without breaking glass parts, materials leaking from their seat, breaking of manoeuvring and locking devices or other damage that affects operation or causes the deterioration of the performance initially possessed.
In the case of the use of hinged and revolving doors, they must be certified in the laboratory according to the test methods contained in the standards:

- UNI EN 947:2000 Hinged or pivoted doors – Determination of vertical load resistance
- UNI EN 948:2000 Hinged or pivoted doors – Determination of static torsional strength

In the case of the use of windows and curtain walls, they must be certified in the laboratory according to the test methods contained in the standards:

- UNI EN 949:2000 Windows and curtain walls, doors and shutters – Determination of the resistance of doors to impact with soft and heavy bodies
- UNI EN 950:2000 Door leaves – Determination of resistance to impact with hard body
- UNI EN 12600:2004 Building glass – Pendulum test – impact test method and classification for flat glass

In the case of the use of screens, they must have passed the tests required by the standards in the laboratory:

- UNI EN 12194:2002 Shutters, external and internal blinds – Misuse – Test methods
- EN 13527:1999 Shutters and blinds – Measurement of operating force – Test methods

In the case of the use of automatically moved screens, they must have passed the tests required by the standard in the laboratory:

- UNI EN 12045:2002 Motorized blackout closures – Safety in use – Measurement of transmitted forces

25.12. Acceptance Requirements

Before being put into production and before installation, each batch of windows and doors must be submitted, upon presentation of a sample of the frame, to the examination and acceptance of the Works Management, which may reject all those which, at its sole discretion, are not equipped with the required requirements.
The acceptance of the windows and doors is not definitive until after assembly on site.
Instability and damage to the window or support or the surrounding masonry must be resolved by the Contractor at his own care and expense, before testing the works.
It should also be noted that the dimensional and performance characteristics prescribed for all the systems adopted present in the abacus of the windows and doors; they must be respected and proven with a specific certification issued by the manufacturer of the system.
Upon completion of the works, before proceeding with testing, the Works Manager reserves the right to ask the manufacturer of the system for a declaration certifying the quality and adequacy of the materials used, as well as the installation of the same in a workmanlike manner.

25.13. CW06, CW07, CW09 - Continuous glazed façade with thermal break system, type Schüco FWS 50 HI

Construction, as indicated in the project drawings, of a curtain wall with thermal break aluminum profiles type Schüco FWS 50 HI (High Insulation) to be submitted to the approval of the D.L., consisting of:
Load-bearing structure made of extruded upright and transom profiles in primary aluminium alloy EN AW-6060 belonging to the Schüco FWS 50 HI (High Insulation) series.
The surface treatment will be carried out in plants approved according to the technical guidelines of the QUALICOAT quality mark for painting and QUALANOD, EURAS-EWAA for anodic oxidation. The coatings will have to meet the fundamental requirements of international standards such as AAM2603, BS6496, UNI EN 12206 and some ranges also GSB approval.
The anodic oxidation must have the properties required by the UNI10681.
The depth of the profiles, available in different sizes, must be chosen in accordance with the static calculation assuming the design loads and according to current regulations, while the visible section of the profile will be 50mm.
The construction must have three levels of mechanical drainage identified in a 3rd level upright and 2nd and 1st level crosspieces.

Thermal insulation: The interruption of the thermal bridge between the internal structural part and the external closing covers is achieved through the use of special strips in synthetic material with high thermal insulation, applied continuously along the entire length of the mullion and transom structures, they are composed of a rigid insulating PET body and PE foam inserts.
The pressers for the retention of the infill will be available in two different construction types, variant 1 in plastic material or variant 2 in aluminum with continuous complementary insert in PE foam with aluminized tape for the reduction of dispersion by radiation

The Uf value of thermal transmittance is thus variable according to the construction depth of the structural elements, the length of the insulating strip used and the type of cover to be screwed on.
The same, calculated according to UNI EN ISO 10077-2 or verified in the laboratory according to the UNI EN ISO 12412-2, must be between 0.72 W/m² °K ≤ Uf ≤ 1.20 W/m² °K.

Drainage and ventilation: the structural profiles will be equipped with channels at different heights at the base of the glass housing seats. Any infiltration or condensation water will thus be drained from the collection plane of the crossbar to the lower one of the upright and from there guided to the base of the construction.
In order to be able to implement complex architectural solutions, profiles must be available that have intermediate collection planes (1st and 2nd level).
Drainage and ventilation of the glass seat will take place from the four corners of each individual mirror through the mullion profile.
If the glass manufacturer requires it, it will be possible to provide ventilation and drainage of each individual mirror directly to the outside.
Depending on the height of the façade and the position of the expansion joints, special parts will be inserted on the upright whose function will be to drain any infiltration or condensation water and to allow ventilation of the glass seat. These details must also be able to be inserted when the structure is laid.
In correspondence with the transverse-upright joints, an EPDM sealing detail will be inserted which, in addition to creating a water barrier, will also prevent the emergence of annoying creaks due to dimensional variations of the structure (expansions).
This function can also be achieved by applying the die-cut gasket on the upright with the front part to be removed at the junction with the crosspiece.
The internal seal will therefore be guaranteed by the type of joint patented throughout Europe and by the EPDM parts, avoiding the use of sealant.
Accessories: the connection of the crosspieces to the uprights will be made by means of screws and U-bolts and must be chosen according to the weight of the infills, the static needs and the type of assembly in accordance with the provisions of the system supplier.
At the end of the crosspieces, there will be plastic masks whose function will be to absorb dimensional variations and at the same time to ensure an aesthetically pleasing connection.
The U-bolts will be made of aluminum and must allow the assembly of the crosspieces even when uprights have already been laid; The fixing screws and bolts will be made of stainless steel.
The accessories of the system must be made, according to the needs, with materials perfectly compatible with the aluminum alloys used for the extrusion of the profiles such as: stainless steel, aluminum (die-cast or extruded), synthetic materials.
The system must include cross and/or T-shaped U-bolts to be able to support rear-end collisions up to 910Kg.

Handling accessories: by means of special insertion frames, it will be possible to insert entrance doors and windows of all types into the façade grid, both with inward and outward opening.
All the handling accessories will be the original ones of the system and must be chosen according to the indications given in the technical documentation in the catalog according to the size and weight of the door.

Gaskets and sealants: the glazing gaskets will be made of elastomer (EPDM) and will be supplied pre-die-cut, they will compensate for the significant differences in thickness deriving from the insertion of the double glazing sheets inside the façade grid, while ensuring a correct perimeter working pressure.
The external glazing gaskets will be inserted directly into the covers to be screwed in the case of vertical and straight facades; at crossings, pre-moulded EPDM crosses must be used to ensure tightness and avoid the use of sealant. These joints will have to be die-cut so that drainage and ventilation can be carried out if necessary. It must distance the infill by 5 mm from the closing presser.
The internal EPDM glazing gaskets must have different heights to compensate for the different positioning of the seats given by the overlapping of the crosspiece on the upright.
The system must also include the variant with internal glazing gaskets with a coplanar finish; finally, the joints of the internal glazing gaskets must be sealed with the appropriate Schüco sealant/adhesive.
To guarantee originality, all gaskets must be marked continuously with the indication of the number from the article and the manufacturer's trademark.
In the case of sloping facades and roofs, the external seal will be achieved using an aluminized butyl tape with a double EPDM gasket on the aluminum cover; It consists of three layers and exactly one sheet of transparent synthetic material, an aluminium film and a layer of butyl sealant.

Glazing: the weight of the infill sheets will be supported by special metal strengths (system accessories) that will transmit it to the structure.
The glass supports must be hooked to the profiles crosswise by means of a special anchoring tooth, have a length of 100 mm and be made in such a way as not to prevent the correct drainage and ventilation of the glass seat.
The supports will be available in different construction types depending on the type of use and the thickness and load of the glass sheet they will have to support.
The glass panes will be laid on plastic supports of 100mm in length.
The construction will allow the insertion of infills from 28 to 86mm.
Thanks to the configuration of the cover to be tightened, the fixing screws will be provided with a center distance of 300mm.

Attacks on the masonry: the installation must be carried out in such a way as to guarantee the achievement of the thermo-acoustic performance required in the project.
Perimeter sealing barriers
In the installation of the façade, two sealing barriers must be built, the internal vapour-tight and the external weather-tight one.
It is also advisable to fill the spaces between the structural elements of the façade and the masonry with suitable materials of different rigidities (mineral wool, sound-absorbing plasterboard, closing sheets.
For this reason, the system must include special profiles in synthetic material so as to be able to guarantee the correct alignment of the sealing surfaces and thermal insulation even in the areas of connection to the masonry.

These profiles must be prepared for the application of EPDM sheaths that will connect the structure of the façade to the masonry works, creating a definitive perimeter closure that is airtight and watertight.

Façade performance: they will refer to the following laboratory test methodologies and related classifications according to European standards:

- Air permeability: classification according to UNI EN 12152. The façade, fixed grid, must be classified: **Class AE**
- Water tightness: classification according to UNI EN 12154. The façade, fixed grid, must be classified: **Class RE 1200**
- Wind resistance: classification according to UNI EN 12179. Lattice will be sized according to the design loads
- Impact resistance: classification according to UNI EN 13049: The construction will be **I5/E5 certified**
- Falling into the void: classification according to UNI EN 12600: The construction is suitable to be applied with this function

As far as acoustic performance is concerned, the necessary soundproofing power value must be determined according to the intended use of the adjacent rooms and the performance of the other materials making up the external walls, on the basis of the provisions of the D.P.C.M. decree of 5/12/97 on the passive requirements of buildings. The façade windows described above
At the time of supply, the window manufacturer must document and certify the performance of the fixtures as well as the laboratories and methodologies used for the checks. In particular, the overall thermal transmittance must guarantee the provisions of the Emilia Romagna Region legislation in force regarding minimum energy performance requirements for buildings and the Interministerial Decree of 26 June 2015 - Adaptation of national guidelines for the energy certification of buildings.

On a project basis, we distinguish the following types of façade:

- CW06: glass curtain wall system for offices H 390cm, with fixed fanlight and underlight in spandrel glass RAL 7046 color and transparent glass;
- CW07: glass curtain wall system for offices H 280cm;
- CW09: glazed curtain wall system for entrance H 390cm.

The price includes and compensates for the drawings as built, the execution of mock-ups if required in the project, the formation of provisional works for the execution of the works in safety, the transport, unloading, handling and pulling at height of materials, the safe handling of glass panes, masonry assistance for installation, labor by specialized personnel in compliance with UNCSAAL DT.16 requirements, the sealing between the window and the building context, the suitable complete sampling of accessories that the Contractor must present before the start of the works, the certifications on the performance of the elements that make up the façade, as per the regulations in force, compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

25.14. WI01 – Single leaf windows with hinged/bottom-hung opening, dimensions 105 x H 210cm, type SCHUCO AWS 75 BS HI

Supply and installation of single-leaf external windows with both hinged and bottom-hung opening, single window dimensions 105xH210cm, with reflective glass to prevent viewing from the outside, type SCHUCO AWS 75 BS, frame color RAL 7046, to be submitted to the approval of the D.L., having the following characteristics:

Structure: The windows will be built with the use of aluminum alloy profiles and will belong to the SCHÜCO AWS 75 BS.HI series.
The metal profiles will be extruded in primary aluminum alloy EN AW-6060.
The surface treatment will be carried out in plants approved according to the technical guidelines of the Qualicoat quality mark for painting and Qualanod for anodic oxidation.
In addition, the painting must have the properties required by the UNI 9983 standard, while the anodic oxidation must have those required by UNI 10681.
The width of the fixed frame will be 75 mm, while that of the overlapping sash (inside) will measure 77.5 mm.
All profiles, both frame and sash, must be made according to the principle of the 3 chambers, i.e. consisting of internal and external tubular profiles and the insulation area, to ensure good mechanical resistance and stable and well-aligned 45° and 90° joints.
The strike wings of the fixed frame profiles (L, T etc.) will be 40.5 mm high.
The opening sash profile will be hidden by the fixed frame and will therefore remain invisible from the outside. The external semi-profiles of the frame profiles must be equipped with a seat on the masonry side to allow the possible insertion of architraves for the finishing of the connection to the building structure.
It must be possible to create different finishes and colors on the internal and external frame semi-profiles.

Thermal insulation: The connection between the internal and external parts of the profiles will be made continuously and definitively by means of strips of thermally insulating synthetic material (Polythermid or Polyamide).
The Uf value of effective thermal transmittance will vary according to the ratio between the visible aluminium surfaces and the width of the insulation zone.
The same will be calculated according to UNI EN ISO 10077-2 or verified in the laboratory according to UNI EN ISO 12412-2 standards and must be between:
- 1.5 W/m²°K ≤ Uf ≤ 1.7 W/m²°K for fixed parts
- between 1.8 W/m²°K ≤ Uf ≤ 2.0 W/m²°K for the opening parts.

The insulating strips must be equipped with two aluminium inserts, positioned in correspondence with the coupling area, to increase the resistance to sliding of the joint.
The slats of the frame profiles will be of the multi-tubular type, and will also be equipped with a foam insert for the reduction of thermal transmittance by radiation and convection.
The rebate strip on the door will also be of the most tubular type.
The width of the strips will be at least 34 mm for the sashes and 42.5 mm for the fixed frames.

Drainage and ventilation: On all frames, fixed and openable, work will be carried out to ensure the drainage of water around the glass and the rapid compensation of air humidity in the containment chamber of the slabs.
The profiles must have strips perfectly coplanar with the transverse walls of the internal semi-profiles to avoid the stagnation of any water from infiltration or condensation.
The external semi-profiles, on the other hand, will have the transverse walls positioned lower to facilitate drainage to the outside (fixed frames) or in the open joint chamber (openable frames). The drainage and ventilation of the sash must not be carried out through the insulation area but through the external profile.
The drainage slots of the frames will be protected externally with special shells, which in the case of particularly windy areas, in correspondence with fixed mirrors, will be equipped with a membrane.

Accessories: The 45° and 90° joints will be made by means of special brackets and U-bolts, in aluminum alloy for the internal half-profile, or in stainless steel for the external half-profile.
The brackets will also be equipped with channels for the distribution of glue.
The gluing will be carried out after assembling the frames allowing the correct distribution of the glue over the entire joint and where else necessary.
Alignment elements and sealing support will also be provided to be mounted after the assembly of the joints.
In the case of joints with U-bolts, sealing parts made of foam must be provided to be used for sealing in correspondence with the insulating strips.
Both corner and T-joints must provide for both tubulars, internal and external, brackets or U-bolts mounted with pins, screws or by deformation.
The parts subject to wear will be mounted and blocked by contrast in order to allow rapid adjustment or replacement even by non-specialized personnel and without mechanical processing.

Handling accessories: The handling accessories will be the original ones of the Avantec SimplySmart system and must be chosen according to the indications given in the manufacturer's technical documentation, depending on the size and weight of the door, provided handle with RAL 7046 color handle with hammer closure with key.

Gaskets and sealants: All joints between the profiles will be glued and sealed with SCHÜCO 2-component polyurethane metal glue.
The glazing gaskets will be made of elastomer (EPDM) and will compensate for the thickness tolerances of the double glazing and/or laminated panes, while ensuring a correct perimeter working pressure.
The external glazing gasket of the fixed mirrors will be of suitable thickness, in order to guarantee the flatness of the infills with the parts that can be opened.
The complementary sealing gasket, which will have a co-extruded EPDM foam part, will adopt the dynamic principle of the large swirl pre-chamber (open joint) and will be of the multi-tubular type.
It must be inserted in a seat obtained on the insulating strip in order to ensure optimal coupling and have the stop on a flap of the door that is part of the insulating strip for the total protection of the internal semi-profiles.
The perimeter continuity of the gasket will be ensured through the use of vulcanized corners which, equipped with a special shoulder, will facilitate the gluing of the gasket itself.

Alternatively, vulcanized frames can be provided.
To guarantee originality, all gaskets will be continuously marked with the article number and the SCHÜCO crown.

Glazing: The glazing bead profiles of the doors will be mounted externally, will be visible and can be oxidized or painted at the discretion of the DL. the external glazing gasket will be of the traditional EPDM type (not external insulation)
A coating profile must be provided in correspondence with the fixed mirrors, to be fixed on the internal seat of the frame profile, on which glazing beads will be applied elongated internally to mask the coating profile itself.
In the case of fixed mirrors, the system must also provide for glazing with glazing bead profiles 22 mm high and equipped with fins, inserted by means of plastic locks mounted on the glazing bead itself, which must also compensate for the dimensional tolerances and thicknesses added, in the case of painting, to ensure correct coupling in any situation.
The glazing beads must be shaped in such a way as to support the internal glazing belt gasket at full height to allow optimal pressure on the glass sheet.
The glass supports in the doors will be made with a 100 mm long plastic plug, while in the fixed mirrors the special tubular snap support in extruded PVC provided by the system must be used. These supports must also be made in such a way as not to prevent the correct drainage and ventilation of the glass seat.

Performance: The performance of the windows and doors will be referred to the following laboratory test methods and the related classifications according to European standards:
- Air permeability for windows and doors classification according to UNI EN 12207, test method according to UNI EN 1026
The window must be classified with a minimum value: **Class 4**
- Watertightness for windows and doors classification according to UNI EN 12208, test method according to UNI EN 1027
The window (for classification of fully exposed windows) must be classified with a minimum value: **Class 9A**
- Wind resistance for windows and doors classification according to UNI EN 12210, test method according to UNI EN 12211
The window must be checked at the design loads
- Mechanical properties according to UNI EN 13115, The window will be classified with a minimum value: **Class 4**
- Mechanical durability for windows and doors classification according to UNI EN 12400, The window will be classified with a minimum value: **Class 3**

As far as acoustic performance is concerned, the necessary soundproofing power value must be determined according to the intended use of the adjacent rooms and the performance of the other materials making up the external walls, on the basis of the provisions of the D.P.C.M. decree of 5/12/97 on the passive requirements of buildings.

Including: suitable fixing/anchoring systems for any type of masonry or plasterboard wall, work for door compartment adaptation (small demolitions, plaster and painting repairs), any finishing padding,

architraves, seals, gaskets, special pieces, adaptations during construction, loading, unloading, handling on site, final cleaning, masonry assistance, the appropriate complete sampling of accessories that the Contractor must present before the start of the works, the Certification, compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner, in perfect continuity with the existing skylight.

25.15. WI02 – RC3 fixed internal window for burglar-proof security room, dimensions 120x135cm

Supply and installation of RC3 burglar-proof internal fixed window for security room, having the following characteristics:
- fixed window
- Frame and window colour: RAL 7046
- Size: 120x135cm
- RC3 burglar-proof
- glass: P6B – 44.4 4S+15+44.6
- extra glass: Argon gas + hot duct
- aesthetic line: flat
- profiles: flat, angle, tube
- Glass transmittance Ug=1.0 W/(m2k)
- Thermal transmittance Uw: 1.1 W/(m2k)

Type, surface finish, size and colour will be subject to approval by the D.L./D.A. after sampling.

Including: suitable fixing/anchoring systems for any type of masonry or plasterboard wall, work for door compartment adaptation (small demolitions, plaster and painting repairs), any finishing padding, architraves, seals, gaskets, special pieces, adaptations during construction, loading, unloading, handling on site, final cleaning, masonry assistance, the appropriate complete sampling of accessories that the Contractor must present before the start of the works, the Certification, compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner, in perfect continuity with the existing skylight.

25.16. WI03 – RC3 burglar-proof windows with single leaf with hinged/bottom-hung opening, dimensions 105 x H 210cm, type SCHUCO AWS 75 BS HI

Supply and installation of RC3 burglar-proof windows, with single leaf with both hinged and bottom-hung opening, single window dimensions 105xH210cm, with reflective glass to prevent viewing from the outside, type SCHUCO AWS 75 BS, frame color RAL 7046, to be submitted to the approval of the D.L., having the following characteristics:

Structure: The windows will be built with the use of aluminum alloy profiles and will belong to the SCHÜCO AWS 75 BS.HI series.
The metal profiles will be extruded in primary aluminum alloy EN AW-6060.
The surface treatment will be carried out in plants approved according to the technical guidelines of the Qualicoat quality mark for painting and Qualanod for anodic oxidation.

In addition, the coating must have the properties required by the UNI 9983 standard, while the anodic oxidation must have those required by UNI 10681.
The width of the fixed frame will be 75 mm, while that of the overlapping sash (inside) will measure 77.5 mm.
All profiles, both frame and sash, must be made according to the principle of the 3 chambers, i.e. consisting of internal and external tubular profiles and the insulation area, to ensure good mechanical resistance and stable and well-aligned 45° and 90° joints.
The strike wings of the fixed frame profiles (L, T etc.) will be 40.5 mm high.
The opening sash profile will be hidden by the fixed frame and will therefore remain invisible from the outside. The external semi-profiles of the frame profiles must be equipped with a seat on the masonry side to allow the possible insertion of architraves for the finishing of the connection to the building structure.
It must be possible to create different finishes and colors on the internal and external frame semi-profiles.

Thermal insulation: The connection between the internal and external parts of the profiles will be made continuously and definitively by means of strips of thermally insulating synthetic material (Polythermid or Polyamide).
The Uf value of effective thermal transmittance will vary according to the ratio between the visible aluminium surfaces and the width of the insulation zone.
The same will be calculated according to UNI EN ISO 10077-2 or verified in the laboratory according to UNI EN ISO 12412-2 standards and must be between:
- 1.5 W/m²°K ≤ Uf ≤ 1.7 W/m²°K for fixed parts
- between 1.8 W/m²°K ≤ Uf ≤ 2.0 W/m²°K for the opening parts.

The insulating strips must be equipped with two aluminium inserts, positioned in correspondence with the coupling area, to increase the resistance to sliding of the joint.
The slats of the frame profiles will be of the multi-tubular type, and will also be equipped with a foam insert for the reduction of thermal transmittance by radiation and convection.
The rebate strip on the door will also be of the most tubular type.
The width of the strips will be at least 34 mm for the sashes and 42.5 mm for the fixed frames.

Drainage and ventilation: On all frames, fixed and openable, work will be carried out to ensure the drainage of water around the glass and the rapid compensation of air humidity in the containment chamber of the slabs.
The profiles must have strips perfectly coplanar with the transverse walls of the internal semi-profiles to avoid the stagnation of any water from infiltration or condensation.
The external semi-profiles, on the other hand, will have the transverse walls positioned lower to facilitate drainage to the outside (fixed frames) or in the open joint chamber (openable frames). The drainage and ventilation of the sash must not be carried out through the insulation area but through the external profile.
The drainage slots of the frames will be protected externally with special shells, which in the case of particularly windy areas, in correspondence with fixed mirrors, will be equipped with a membrane.

Accessories: The 45° and 90° joints will be made by means of special brackets and U-bolts, in aluminum alloy for the internal half-profile, or in stainless steel for the external half-profile.

The brackets will also be equipped with channels for the distribution of glue.
The gluing will be carried out after assembling the frames allowing the correct distribution of the glue over the entire joint and where else necessary.
Alignment elements and sealing support will also be provided to be mounted after the assembly of the joints.
In the case of joints with U-bolts, sealing parts made of foam must be provided to be used for sealing in correspondence with the insulating strips.
Both corner and T-joints must provide for both tubulars, internal and external, brackets or U-bolts mounted with pins, screws or by deformation.
The parts subject to wear will be mounted and blocked by contrast in order to allow rapid adjustment or replacement even by non-specialized personnel and without mechanical processing.

Handling accessories: The handling accessories will be the original ones of the Avantec SimplySmart system and must be chosen according to the indications given in the manufacturer's technical documentation, depending on the size and weight of the door, provided handle with RAL 7046 color handle with hammer closure with key.

Gaskets and sealants: All joints between the profiles will be glued and sealed with SCHÜCO 2-component polyurethane metal glue.
The glazing gaskets will be made of elastomer (EPDM) and will compensate for the thickness tolerances of the double glazing and/or laminated panes, while ensuring a correct perimeter working pressure.
The external glazing gasket of the fixed mirrors will be of suitable thickness, in order to guarantee the flatness of the infills with the parts that can be opened.
The complementary sealing gasket, which will have a co-extruded EPDM foam part, will adopt the dynamic principle of the large swirl pre-chamber (open joint) and will be of the multi-tubular type.
It must be inserted in a seat obtained on the insulating strip in order to ensure optimal coupling and have the stop on a flap of the door that is part of the insulating strip for the total protection of the internal semi-profiles.
The perimeter continuity of the gasket will be ensured through the use of vulcanized corners which, equipped with a special shoulder, will facilitate the gluing of the gasket itself.
Alternatively, vulcanized frames can be provided.
To guarantee originality, all gaskets will be continuously marked with the article number and the SCHÜCO crown.

Glazing: The glazing bead profiles of the doors will be mounted externally, will be visible and can be oxidized or painted at the discretion of the DL. the external glazing gasket will be of the traditional EPDM type (not external insulation)
A coating profile must be provided in correspondence with the fixed mirrors, to be fixed on the internal seat of the frame profile, on which glazing beads will be applied elongated internally to mask the coating profile itself.
In the case of fixed mirrors, the system must also provide for glazing with glazing bead profiles 22 mm high and equipped with fins, inserted by means of plastic locks mounted on the glazing bead itself, which must also compensate for the dimensional tolerances and thicknesses added, in the case of painting, to ensure correct coupling in any situation.

The glazing beads must be shaped in such a way as to support the internal glazing belt gasket at full height to allow optimal pressure on the glass sheet.
The glass supports in the doors will be made with a 100 mm long plastic plug, while in the fixed mirrors the special tubular snap support in extruded PVC provided by the system must be used. These supports must also be made in such a way as not to prevent the correct drainage and ventilation of the glass seat.
Glass type: P6B – 44.4 4S+15+44.6

Performance: The performance of the windows and doors will be referred to the following laboratory test methods and the related classifications according to European standards:
- Air permeability for windows and doors classification according to UNI EN 12207, test method according to UNI EN 1026
The window must be classified with a minimum value: **Class 4**
- Watertightness for windows and doors classification according to UNI EN 12208, test method according to UNI EN 1027
The window (for classification of fully exposed windows) must be classified with a minimum value: **Class 9A**
- Wind resistance for windows and doors classification according to UNI EN 12210, test method according to UNI EN 12211
The window must be checked at the design loads
- Mechanical properties according to UNI EN 13115, The window will be classified with a minimum value: **Class 4**
- Mechanical durability for windows and doors classification according to UNI EN 12400, The window will be classified with a minimum value: **Class 3**

As far as acoustic performance is concerned, the necessary soundproofing power value must be determined according to the intended use of the adjacent rooms and the performance of the other materials making up the external walls, on the basis of the provisions of the D.P.C.M. decree of 5/12/97 on the passive requirements of buildings.

Including: suitable fixing/anchoring systems for any type of masonry or plasterboard wall, work for door compartment adaptation (small demolitions, plaster and painting repairs), any finishing padding, architraves, seals, gaskets, special pieces, adaptations during construction, loading, unloading, handling on site, final cleaning, masonry assistance, the appropriate complete sampling of accessories that the Contractor must present before the start of the works, the Certification, compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner, in perfect continuity with the existing skylight.

25.17. WI06 – RC3 internal burglar-proof fixed window, EI60 certified, dimensions 120x135cm

Supply and installation of RC3 burglar-proof internal fixed window with EI60 certification, having the following characteristics:
- fixed window

- Frame and window colour: RAL 7046
- Size: 120x135cm
- RC3 burglar-proof
- EI60 certified fire resistance
- glass: P6B – 44.4 4S+15+44.6
- extra glass: Argon gas + hot duct
- aesthetic line: flat
- profiles: flat, angle, tube
- Glass transmittance Ug=1.0 W/(m2k)
- Thermal transmittance Uw: 1.1 W/(m2k)

Type, surface finish, size and colour will be subject to approval by the D.L./D.A. after sampling.

Including: suitable fixing/anchoring systems for any type of masonry or plasterboard wall, work for door compartment adaptation (small demolitions, plaster and painting repairs), any finishing padding, architraves, seals, gaskets, special pieces, adaptations during construction, loading, unloading, handling on site, final cleaning, masonry assistance, the appropriate complete sampling of accessories that the Contractor must present before the start of the works, the Certification, compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner, in perfect continuity with the existing skylight.

25.18. GD01 – Glazed entrance door with double leaf and fixed partitions type SCHUCO ADS 75 HD

Supply and installation of a glazed entrance door consisting of a double hinged leaf dimensions (110+110) 220 x H 320cm, including push bar for emergency exit, and fixed partitions, see project drawing, type SCHUCO ADS 75 HD to be submitted to the approval of the D.L., color of the profiles RAL 7046, consisting of:

Structure: The windows and doors will be built with the use of EN AW6060 primary aluminum alloy profiles and will belong to the SCHÜCO ADS 75 HD series.
The surface treatment will be carried out in plants approved according to the technical guidelines of the Qualicoat quality mark for painting and Qualanod for anodic oxidation.
In addition, the coating must have the properties required by the UNI 9983 standard, while the anodic oxidation must have those required by UNI 10681.
The width of the fixed frame will be 75 mm as for the coplanar sash, both outside and inside. All profiles, both frame and sash, must be made according to the principle of the 3 chambers, i.e. consisting of internal and external tubular profiles and the insulation area, to ensure good mechanical resistance and stable and well-aligned 45° and 90° joints.
The strike wings of the fixed frame profiles (L, T etc.) will be 25 mm high.
The external half-profiles of the box profiles must be equipped with a seat on the masonry side to allow the possible insertion of architraves for the finishing of the connection to the building structure.
The internal and external visible walls of the sash profiles will have a nominal thickness of 2 mm with a tolerance of ± 0.2 mm.

It must be possible to create different finishes and colors on the interior and exterior profiles if necessary.

Thermal insulation: The connection between the internal and external parts of the profiles will be made continuously and definitively by means of strips of thermally insulating synthetic material (Polythermid or Polyamide).
The thermal transmittance value of the individual sections Uf, calculated according to UNI EN ISO 10077-2 or verified in the laboratory according to UNI EN ISO 12412-2 standards, will be 2.21 W/m²°K in the case of types with frame + 147 mm sash coupling.
The insulating strips must be equipped with two aluminium inserts, positioned in correspondence with the coupling area, to increase the resistance to sliding of the joint. This resistance, measured on profiles already treated or subjected to a suitable thermal cycle, will be greater than 2.4 KN (test performed on 10 cm of profile).
The insulating strips must have a width of 27.5 mm for the sash profiles and 40.0 mm for the fixed frames.
The sash profiles must be coupled with two-piece insulating strips in order to reduce the possible deformations caused by sudden temperature differences that could be created between the internal and external profiles.
Drainage and ventilation: On all frames, fixed and openable, work will be carried out to ensure the drainage of water around the glass and the rapid compensation of air humidity in the containment chamber of the slabs.
The profiles must have strips perfectly coplanar with the transverse walls of the internal semi-profiles to avoid the stagnation of any water from infiltration or condensation.
The external semi-profiles, on the other hand, will have the transverse walls positioned lower to facilitate drainage to the outside (fixed frames).

Accessories and equipment: The 45° and 90° joints will be made by means of special brackets and U-bolts, in aluminum alloy equipped with channels for correct distribution of the glue. The gluing will thus be carried out after assembling the frames allowing the correct distribution of the glue over the entire joint and where else necessary.
Alignment elements and sealing support will also be provided in stainless steel to be mounted after the assembly of the joints.
In the case of joints with U-bolts, sealing parts made of foam must be provided to be used for sealing in correspondence with the insulating strips. Both corner and T-joints must provide for both tubulars, internal and external, brackets or U-bolts mounted with pins, screws or by deformation.
The parts subject to wear will be mounted and blocked by contrast in order to allow rapid adjustment or replacement even by non-specialized personnel and without mechanical processing.

Handling accessories: The choice of hinges, their fastening system and other additional components such as locks, strikers, handles, etc., must be made according to the dimensions, weights and type of user, in compliance with the indications given in the technical documentation of the system manufacturer.
The equipment must be the original equipment of the system.

Gaskets and sealants: All joints between the profiles will be glued and sealed with SCHÜCO 2-component polyurethane metal glue.
The glazing gaskets will be made of elastomer (EPDM) and will compensate for the significant differences in thickness, inevitable in double glazing and/or laminated panes, while at the same time ensuring a correct perimeter working pressure.
The external glazing gasket must distance the infill by 3 or 4 mm from the metal frame. The rebate gaskets will be made of elastomer (EPDM) and will form a double barrier in the case of coplanar doors, triple in the case of overlapping doors.
To guarantee originality, all gaskets will be continuously marked with the article number and the Schüco brand.

Glazing: The glazing bead profiles will guarantee a minimum insertion of the glass of at least 14 mm. The glazing bead profiles will be inserted by means of plastic locks hooked to the glazing bead itself, the hooking will thus be of absolute safety so that, following openings or due to the thrust of the wind, the glazing bead does not give elastic.
The clamps must also compensate for the dimensional tolerances and the added thicknesses, in the case of painting, to ensure correct coupling in any situation.
The glazing bead profiles must be shaped in such a way as to support the internal glazing belt gasket at full height to allow optimal pressure on the glass sheet. The gasket hooking tooth will be further back than the external edge of the glazing bead in order to reduce the visible section of the gasket reducing the frame effect. The glass supports must be snapped onto the profiles, have a length of 100 mm.

Outward opening performance (threshold profile 381160/244478 + 244654 seal).
The performance of the windows and doors will be referred to the following laboratory test methods and the related classifications according to European standards:
- **Air permeability** for windows and doors classification according to UNI EN 12207, test method according to UNI EN 1026
The window must be classified with a minimum value: **Class 2**
- **Watertightness** for windows and doors classification according to UNI EN 12208, test method according to UNI EN 1027
The window (for classification of fully exposed windows) must be classified with a minimum value: **Class 5A** (single leaf)
The window (for classification of fully exposed windows) must be classified with a minimum value: **Class 3A** (double sash)
- **Wind resistance** for windows and doors classification according to UNI EN 12210, test method according to UNI EN 12211
The window must be checked at the design loads
- Mechanical durability according to UNI EN 12400 The system must be certified in **Class 5**

As far as acoustic performance is concerned, the necessary soundproofing power value must be determined according to the intended use of the adjacent rooms and the performance of the other materials making up the external walls, on the basis of the provisions of the D.P.C.M. decree of 5/12/97 on the passive requirements of buildings.

The price includes and compensates for the charges for the anchoring of the door to the building context, the fixing or grouting elements and any filling of the frame compartments, surveys, inspections and measurements, for the mechanisms and special accessories necessary for adaptation to the various types of doors, for the suitable complete sampling of accessories that the Contractor must present before the start of the works, the Certification of doors for outdoor use, compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

26. BLACKSMITH WORKS

26.1. Generality

The ferrous materials necessary for the processing must be free from slag, blowing, burning, straw or any other apparent or latent defect of casting, rolling, drawing, forging and the like; Subjected to chemical composition checks, they must be free from impurities and abnormal substances.
The iron must be worked diligently with skill, regularity of shape and precision of dimensions, according to the project drawings, with particular attention to welding and boiling. The holes will all be drilled, the nails, riveting, etc., must be burr-free; The cuts are finished in Lima.
All those pieces that present imperfection or evidence of imperfection will be rejected.
The state of finish and any anodic treatments will be prescribed by the Works Management; in any case, the products must be free of sharp, pointed or sharp parts that may constitute a danger to people.
Each work must be equipped with all the accessory elements, from the anchoring clamps to the hardware for maneuvering. The iron parts must be supplied on site with lead treatment.
For each iron work, at the request of the Works Management, the Contractor must submit the relevant model, for prior approval.
The Contractor shall in any case be obliged to check the orders and to detect on the spot the exact measurements of the various iron works, being responsible for any inconveniences that may occur due to the omission of such control.
Once the installation is complete, including the glass, if any, the Contractor is required to check and record the parts that can be opened or dismantled, as well as repairs that may be necessary for accidents that occurred during the assembly of other parts.
Iron works for railings, gates, parapets, railings, etc., are classified according to the processing into the following types:

26.2. Simple design

These are those works in which the bars, profiles or tubular bars are used in straight sections, even intersecting with non-right angles, combined in geometric designs, without special processing, on the bars or parts, which are not necessary for joining (welding, nailing, etc.) and installation (masonry, bolting, etc.) Any elements treated with beating, bending, cutting, drilling, etc. are not included.
Works consisting of bars, profiles, tubulars, also with parts of sheet metal, simple or perforated, or electro-welded mesh are evaluated for their actual weight, or per linear meter of development.

26.3. Complex design

We mean those works in which the bars, profiles or tubulars are not combined in designs deriving from considerations of strength or functionality, but from more properly decorative intentions. So for example for twists, curls, etc.
These works can be evaluated as a body or surface or for their length.
The iron works relating to the construction of stairs will consist of profiles, sheets, plates, grids of various types, according to the project indications. For the formation of steps and landings, self-cleaning, heel-proof, anti-slip, anti-vertigo press-pressed steel sheets can be used.

Where provided for in the project, stainless steel must be used.

Entrance canopy structure
Various elements such as handrails, parts of parapets, various fascias;
All visible connecting elements (bolts, nuts, washers, various bushings)

The metal profiles constituting the façade columns, to be made of S355JR steel, must, in addition to the mechanical requirements, also have the following geometric characteristics:

- Rectilinear development, with deviations from the theoretical axis such as not to compromise the stability of the profile, its coupling with the transverse elements and its aesthetic appearance.
- Any rotations of the middle section around the longitudinal axis (torsions) due to production processes, rather than to subsequent welding of structural elements, must be contained within acceptable limits both from a static and aesthetic point of view.

Specific treatment is provided for this purpose, if necessary, to contain these torsional effects.

- *The profile constituting the columns must have characteristics of continuity along the entire longitudinal development. Therefore, any welding processes that may be required for the production of elements of the required length must take this into account. The welds will then be completely penetrated, smoothed and treated so as not to be perceived by the eye. The position of the sections affected by these welds must be established by the structural D.L.*
- *In order to establish the correspondence of the column elements to what has been described above, it is expected that the builder will create, before the production of the columns, a full-scale sample model of the element itself, so that the structural D.L., the architectural D.L. and the builder can verify the characteristics of the supply.*

Or other possible specifications even more restrictive than those mentioned above may be required by the DL. Verification of a finished element is required before all elements are supplied.

26.4. CW01 – Metal noise barrier, panel size 250x50cm

Supply and installation of a noise barrier for acoustic shielding of Bosco type roof systems with Schallstop ST 2005G aluminum panel or similar to be sampled and submitted to the approval of the D.L., having the following characteristics:
- Total height of the vertical part: 500cm
- length L = 415 meters
- Panel size: 250x50cm
- including metal substructure and fixing hardware, located at a distance of i = 3.0 metres, it will consist of HE type uprights, dimensions to be verified by the Contractor, made of carbon steel and will have mechanical characteristics not lower than S235JR, in accordance with the UNI EN 10025 standard.

The surface protection will be achieved by:
- hot-dip galvanizing, in accordance with UNI EN 1461
- Painting with applications of thermosetting electrostatic polyester powders with polymerization in the oven

The following checks will be carried out on the load-bearing structure according to NTC2018 and more precisely:
- Removal of blanks every 30 tons per profile/casting and verification of resilience, traction and chemistry values
- 100% visual checks of the welds and 10% mt or Ip
- Identification of finished components (punching)
- Dimensional control

The load-bearing structure will be supplied complete with a Declaration of Performance (DoP) according to the UNI EN 1090 standard (mandatory from July 2014).

The fixing will be done by means of galvanized class 8.8 anchor bolts to be inserted into the foundation works

The blind part is made of SCHALLSTOP ST 2005G type aluminum panel, sound-absorbing and sound-insulating, having the following technical characteristics:
- light alloy panels (Al/Mn/Mg2), nominal thickness 12/10 with embossed surface, visible painted with coil-coating process
- side towards the noise source is made of micro-expanded and corrugated sheet metal in natural aluminum with a nominal thickness of 8/10
- inside the casing there is a high-density volcanic rock fiber mat suitably protected in view with black glass veil fabric
- the panel is equipped with rubber gaskets on the heads that give excellent antisonic insulation between the panel and the wings of the vertical uprights
- the panels are coupled together with a double male-female antisonic joint and inserted inside the metal structures of structural containment.
- panel thickness 109mm
- weight 9 kg/sqm

Mineral wools are obtained from the melting and spinning of natural rocks: they are inorganic and amorphous and do not promote the development of mold or bacteria, do not allow the absorption of moisture. Completely free from asbestos fibers or traces.
Technical data:
Density: 50kg/mc
Operating temperature: 600°C
Thermal resistance: 1.35 sqm°C/W
Thermal conductivity: 0.041 W/m°C
Fire behaviour: non-combustible UNI EN 13501-1

The acoustic barrier must guarantee the following parameters:
- Class B3 noise reduction (according to UNI EN ISO 1793) Rw ≥ 30 dB
- Class A3 sound absorption (according to UNI EN ISO 1793) Rw ≥ 0.9
- Wind load and static load: Breaking load 166kg/sqm

Including external casing of the panels, internal insulation, all charges and ancillary works, various hardware.

The price includes and compensates the costs for certifications, for the performance guarantee of the airtightness, watertightness and wind resistance system according to the project and the regulations in force, the charges for cutting the panels according to the design shapes, the scrap, various hardware, the sizing of the substructure, the hooking and fixing elements; the formation and unravelling of internal and external worktops, as well as compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

26.5. CW02 – External wall system composed of 17.2cm thick TRIMO Q-Biss One sandwich panels, including metal substructure, EI60 certified

Supply and installation of a system of external walls composed of sandwich panels with metal substructure, type TRIMO Q-Biss One, thickness 17.2cm, to be submitted to the approval of the D.L., having EI60 fire resistance certification as required by the project, see reference graphic drawings.
Panel type TRIMO Q-Biss T B-B 200/1100 GV 0.70mm, PUR PA 50µm color as per project – 0.50mm SP 25µm; U-value 0.19 W/sqmK.
Class A1 non-combustible mineral wool insulating core.
Reaction to fire: A2-s1, d0.
Water permeability: 1200
Air permeability (C (m3 /Pa*s): C = 0.0046; n = 0.970
Water vapour permeability: waterproof
Aircraft Sound Insulation: Rw 30dB

Including metal substructure and hardware for fixing to load-bearing structures in metal carpentry/building context.

PLEASE NOTE: Including the creation of separation strips, dimensions of at least 100cm, at the arrival of the compartments, both in plan and in section and/or to protect the external stairs. These bands will be in class A2 s1 d0.
The rest of the façade can be in class C-s2 d0.
The walls, in the area of their separation bands, must be certified in class EI60.

The price includes and compensates the costs for the formation of provisional works for the safe execution of the work and subsequent dismantling, the temporary protection of floors and elements within the intervention area with the laying and relative final removal of special protective sheets, the supply and installation of insulation, the cutting and scraping of the slabs, corner guards, the formation of door compartments complete with perimeter reinforcement in metal profiles for anchoring the window, the burden of proceeding at a later time with the application of the slabs while waiting for the execution of electrical and thermo-hydraulic systems to be inserted, the charges for acoustic sealing at the system penetrations, the charges for certifications and acoustic testing, as well as compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

26.6. CW03 – External wall system composed of TRIMO Q-Biss One sandwich panels 10cm thick, with metal substructure, 10cm thick

Supply and installation of a system of external walls composed of sandwich panels with metal substructure, type TRIMO Q-Biss One, thickness 10cm, to be submitted to the approval of the D.L., having EI60 fire resistance certification as required by the project, see reference graphic drawings.
Panel type TRIMO Q-Biss T B-B 200/1100 GV 0.70mm, PUR PA 50µm color as per project – 0.50mm SP 25µm; U-value 0.19 W/sqmK.
Class A1 non-combustible mineral wool insulating core.
Reaction to fire: A2-s1, d0.
Water permeability: 1200
Air permeability (C (m3 /Pa*s): C = 0.0046; n = 0.970
Water vapour permeability: waterproof
Aircraft Sound Insulation: Rw 30dB

Including metal substructure and hardware for fixing to load-bearing structures in metal carpentry/building context.

PLEASE NOTE: Including the creation of separation strips, dimensions of at least 100cm, at the arrival of the compartments, both in plan and in section and/or to protect the external stairs. These bands will be in class A2 s1 d0.
The rest of the façade can be in class C-s2 d0.
The walls, in the area of their separation bands, must be certified in class EI60.

The price includes and compensates the costs for the formation of provisional works for the safe execution of the work and subsequent dismantling, the temporary protection of floors and elements within the intervention area with the laying and relative final removal of special protective sheets, the supply and installation of insulation, the cutting and scraping of the slabs, corner guards, the formation of door compartments complete with perimeter reinforcement in metal profiles for anchoring the window, the burden of proceeding at a later time with the application of the slabs while waiting for the execution of electrical and thermo-hydraulic systems to be inserted, the charges for acoustic sealing at the system penetrations, the charges for certifications and acoustic testing, as well as compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

26.7. CW10 – External wall system composed of sandwich panels type TRIMO FTV, with metal substructure, thickness 17.20cm

Supply and installation of a system of external walls composed of sandwich panels with metal substructure, type TRIMO FTV, thickness 17.20cm, to be submitted to the approval of the D.L., having EI60 fire resistance certification as required by the project, see reference drawings.
Trimoterm Power T FTV HL - 200/1000 GS: 0.70 mm SP 25 µm 9006 / 0.50 mm SP 25 µm 9002
Class A1 non-combustible mineral wool insulating core.
Aircraft Sound Insulation: Rw 30dB

Including metal substructure and hardware for fixing to load-bearing structures in metal carpentry/building context.

PLEASE NOTE: Including the creation of separation strips, dimensions of at least 100cm, at the arrival of the compartments, both in plan and in section and/or to protect the external stairs. These bands will be in class A2 s1 d0.
The rest of the façade can be in class C-s2 d0.
The walls, in the area of their separation bands, must be certified in class EI60.

The price includes and compensates the costs for the formation of provisional works for the safe execution of the work and subsequent dismantling, the temporary protection of floors and elements within the intervention area with the laying and relative final removal of special protective sheets, the supply and installation of insulation, the cutting and scraping of the slabs, corner guards, the formation of door compartments complete with perimeter reinforcement in metal profiles for anchoring the window, the burden of proceeding at a later time with the application of the slabs while waiting for the execution of electrical and thermo-hydraulic systems to be inserted, the charges for acoustic sealing at the system penetrations, the charges for certifications and acoustic testing, as well as compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

26.8. RS02 – Roof system consisting of sandwich panels with metal substructure, 10cm thick

Supply and installation of a roof system consisting of sandwich panels with metal substructure, total thickness 10cm, type TRIMO to be submitted to the approval of the D.L., having EI60 fire resistance certification as required by the project, see reference drawings.
TRIMO Power T FTV type panel - 100/1000 MS 0.55mm SP 25µm color as per project - 0.50mm SP 25µm.

Including metal substructure and hardware for fixing to load-bearing structures in metal carpentry/building context.

The price includes and compensates the costs for the formation of provisional works for the safe execution of the work and subsequent dismantling, the temporary protection of floors and elements within the intervention area with the laying and relative final removal of special protective sheets, the supply and installation of insulation, the cutting and scraping of the slabs, corner guards, the formation of door compartments complete with perimeter reinforcement in metal profiles for anchoring the window, the burden of proceeding at a later time with the application of the slabs while waiting for the execution of electrical and thermo-hydraulic systems to be inserted, the charges for acoustic sealing at the system penetrations, the charges for certifications and acoustic testing, as well as compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

26.9. CW04 – Removable external metal fence for maintenance type Nuova Defim Orsogrill TaliAlive

Supply and installation of an external metal fence, removable for maintenance, type Nuova Defim Orsogrill TaliAlive, thickness 50mm, H 13 meters, composed of modular panels, to be sampled for approval by the D.L.

Consisting of modular, monolithic panels, 46x132mm mesh, horizontal profiles with special section (centre distance 46 mm), vertical round connections with a diameter of 4 mm (centre distance 132 mm).
60x7mm flat posts welded at the 2 ends in order to build a monobloc ready for installation, equipped with appropriate holes for blocking consecutive panels. Wheelbase: 1650-2000mm
Material: COR-TEN steel.
Treatment: possible accelerated oxidation.
Fastening system: TTQST M 10x30 stainless steel or Nerininox anti-theft bolt.

The price includes and compensates: the costs for the installation of a suitable metal carpentry support structure, fasteners between the parts and to the existing structure and/or flooring, restoration of existing flooring, opening elements (hinges, locks, guides, etc.), accessories as per the schedule, special pieces, including the cutting of the elements according to the project configuration, welding, plates, dowels, plates, bolts, various hardware, worktops for any height from the underlying support surface, protections, material unloading, handling on site, removal of waste materials, final cleaning, masonry assistance the Certification of doors for outdoor use, compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the work finished in a workmanlike manner in full compliance with the project graphic drawings.

26.10. DW04 – Internal partition wall in painted metal panels 1.7mm thick – DATA HALL, MEP GALLERY

Supply and installation of an internal partition wall made with painted metal panels, with a thickness of 17/10, anchored to the metal carpentry envisaged by the structural project, shaped as described in the project drawings.
Painted color of your choice to be defined and sampled for approval by the D.L.
No open spaces greater than 1.9cm should be left.
Provide an appropriate sealing system to give continuity between the fanwalls, floor, ceiling and metal carpentry structure.

The price includes and compensates the charges for fastening elements between the parts and to the existing structure and/or flooring, restoration of existing flooring, opening elements (hinges, locks, guides, etc.), accessories, special pieces, cuts, scraps, worktops for any height from the underlying support surface, protections, material unloading, handling on site, clearance of waste materials, final cleaning, masonry assistance the Certification of doors for outdoor use, compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner in full compliance with the project drawings.

26.11. SE01 – Prefabricated Ceiling Anchored Cabinet with Double Sliding Door on Short Sides - HAC

Supply and installation of a prefabricated cabinet anchored to the ceiling with a maximum of 24 standard racks per side, type TATE Hot Aisle Containment to be submitted to the approval of the D.L., with double sliding doors on the short sides.
Dimensions of the hot aisle: W 180cm x D 1450cm x H 500cm.
Tate's hot corridor suspended from the ceiling: The containment system is a pre-engineered solution that channels hot air from IT equipment into an elevated plenum. It improves data center airflow while also giving the flexibility to store services on the ceiling.
Specifications:
Extruded aluminium elements
Finish: Powder Coating

Containment mounting: Designed for seamless integration and full compatibility with your existing Tate.
Structural Grid Ceiling: Hang hallway containment partitions and Tate Grid structural ceiling structures without the need for custom solutions.

For installation of the system, refer to the manufacturer's data sheets and specifications.

The price includes and compensates the costs for the formation of provisional works for the safe execution of the work and subsequent disassembly, the temporary protection of floors and elements within the intervention area with the installation and relative final removal of special protective sheets, the charges for certifications and acoustic testing, as well as compliance with the CE marking and the PDO Product Production Declaration for products of construction provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

26.12. Volumes at plant closure

Volumes at the end of the systems, consisting of horizontal self-supporting metal panels (RS03) 80mm thick, and vertical metal walls (DW20) 60mm thick, laid on metal carpentry at the expense of the Structural Project; composite system as described below:

26.12.1. RS03 – Self-supporting insulated metal panel 8cm thick

Supply and installation, horizontally closing the volume and as indicated in the project drawings, of a type of insulated metal panel to be defined and sampled for approval by the D.L.: rock wool sandwich panel for roofs, total thickness 80mm.
Composed as follows:
- 5mm thick metal sheet
- external transparent polyethylene protection film
- 70mm thick rock mineral wool
- internal protection film in transparent polyethylene
- 5mm thick metal sheet

Having the following main technical characteristics:
- thermal conductivity of rock wool λ= 0.042 W/mK
- transmittance 0.34 W/m2K

The price includes and compensates the costs for the formation of provisional works for the safe execution of the work and subsequent dismantling, the temporary protection of floors and elements within the intervention area with the laying and relative final removal of special protective sheets, the supply and installation of insulation, the cutting and scraping of the slabs, corner guards, the formation of door compartments complete with perimeter reinforcement in metal profiles for anchoring the window, the burden of proceeding at a later time with the application of the slabs while waiting for the execution of electrical and thermo-hydraulic systems to be inserted, the charges for acoustic sealing at the system penetrations, the charges for certifications and acoustic testing, as well as compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

26.12.2. DW20 – Self-supporting insulated metal panel 6cm thick

Supply and installation, with vertical closure of the volume and as indicated in the project drawings, of an insulated metal panel, a type to be defined and sampled for approval by the D.L.: rock wool sandwich panel for vertical partitions.
Composed as follows:
- external support in metal sheet 0.60mm thick
- 58.8mm thick rigid rock mineral wool
- 0.5mm steel metal sheet

The price includes and compensates the costs for the formation of provisional works for the safe execution of the work and subsequent dismantling, the temporary protection of floors and elements within the intervention area with the laying and relative final removal of special protective sheets, the supply and installation of insulation, the cutting and scraping of the slabs, corner guards, the formation of door compartments complete with perimeter reinforcement in metal profiles for anchoring the window, the burden of proceeding at a later time with the application of the slabs while waiting for the execution of electrical and thermo-hydraulic systems to be inserted, the charges for acoustic sealing at the system penetrations, the charges for certifications and acoustic testing, as well as compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

26.13. DW21 – Kingspan Welded metal grating interior wall

Supply and installation of an internal wall in metal grating type Kingspan Welded Tate Secure Data Sheet, to be submitted for approval by D.L.
Tate Secure is a modular and reconfigurable system, available in various heights and widths.
The mesh panels are welded to a steel frame which improves their strength and stability.
The panels are available as standard with a stainless steel finish or painted steel in a choice of white, grey or black.

Key features:
- Dimensions 13x13x3mm
- Weight: 7.6kg/sqm
- thickness 3mm
- Opening 64%
- 40x40x3mm folded frame, "L" frame angle

For assembly, refer to the supplier's technical data sheets.

The price includes and compensates for the fastening or alloying elements, structure, surveys, inspections and measurements, for the suitable complete sampling of accessories that the Contractor must present before the start of the works, the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

26.14. DW25, RS04 – 1.5cm thick pre-painted external metal sheet

Supply and installation of external metal sheet for the function of a metal box, with a thickness of 1.5cm, pre-painted in RAL 1036 color to be sampled for approval by the D.L., development as per the project graphic drawings, with vertical and horizontal cladding and closure on the façade, on a metal carpentry structure by the structural project, to be verified at the expense of the Contractor.

The price includes and compensates for surveys, inspections and measurements, the supply of all the necessary materials, transport to the construction site, storage and movement from the place of storage to the place of use, suitable fastening systems, special pieces, cutting, scrap, overlapping, any specific solutions in correspondence with the structural joints and plant passages, the cleaning and removal of the resulting materials, the sorting and differentiation of the same and the disposal in landfills, including charges. All in compliance with what is indicated in the project drawings, compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

26.15. DW30 – Sandwich panel exterior walls with metal substructure, 8cm thick, EI60 certified

Supply and installation of a system of external walls composed of mineral fiber sandwich panels with metal substructure, panel thickness 8cm, Isoparfire type or similar to be submitted to the approval of the D.L., having EI60 fire resistance certification as required by the project, for the external sprinkler rooms, see reference drawings.
Transmittance value U: 0.47/0.49 W/sqmK.

Including metal substructure and hardware for fixing to load-bearing structures in metal carpentry/building context.

The price includes and compensates the costs for the formation of provisional works for the safe execution of the work and subsequent dismantling, the temporary protection of floors and elements

within the intervention area with the laying and relative final removal of special protective sheets, the supply and installation of insulation, the cutting and scraping of the slabs, corner guards, the formation of door compartments complete with perimeter reinforcement in metal profiles for anchoring the window, the burden of proceeding at a later time with the application of the slabs while waiting for the execution of electrical and thermo-hydraulic systems to be inserted, the charges for acoustic sealing at the system penetrations, the charges for certifications and acoustic testing, as well as compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

26.16. FL16 - Heel-resistant electro-welded grating floor – TECHNICAL ROOMS AND PLANT SHAFTS

Supply and installation of flooring for shafts, systems and technical rooms, made of modular panels in anti-heel pressed grating type Nuova Defin, Orsogril Potissimum Edilizia made of S235JR steel according to UNI EN 10025, hot-dip galvanized according to UNI EN ISO 1461.
Edged to size as indicated in the project drawings, consisting of a load-bearing bar, flat transversal bars, mesh, edging frame, grating hook, fixing frame, fixing from below or above at the choice of the D.L.
Finishing by painting RAL color to be defined at the choice of the D.L., to be sampled for approval.
Laid on a structural frame made of steel profiles with L-shaped section, designed for fixing on a structural support duly sized by the supplier and subject to the approval of the D.L.
Including the supply of open/removable modules to ensure the inspection of the premises.

The price includes and compensates for the surveys, inspections and measurements, the drawing as built to be submitted to the approval of the D.L., the sampling of the finish, the masonry works, the grating hooks, the formation of the frame seat, the clamps for housing the clamps, the installation of the frame and fixed panels, the welds, various hardware, the skilled blacksmith workforce, including cutting the elements according to the project configuration, laying at level.
The Contractor is also responsible for the costs for the barriers and the installation of the necessary signs prescribed by safety regulations as well as any related charges and services of labour, provisional protection works, tools and anything necessary for the precise and correct execution of the works. Including, where necessary, cement sealing, smoothing, recovery, masonry work in general, etc., compliance with the CE and DOP marking for construction products provided for by Regulation No. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

26.17. WI04 – Metal air expulsion grilles

Supply and installation of metal air expulsion grilles, to be positioned according to the project indications.
All the elements are painted, by laying anti-rust and epoxy powder coating with RAL 7046 color finish to be sampled for approval by the D.L.
Made of sturdy galvanized steel profile, EGZ 50 type grille, CTP counterframe, suitable for both air intake and expulsion.

On a project basis, we distinguish the following dimensions:
- WI04: dimensions 105x65cm

The price includes and compensates for the survey, sizing and static verification of the substructure, the design as built, the charges for cutting the panels according to the Project shapes, the supply of the end pieces with bevelled edges, the grouting of the joints with white or colored cement, special pieces for grafts in the cladding, the worktops for any height from the underlying support surface, protections to protect adjacent buildings and works already completed, final cleaning, masonry assistance and any other charge and accessory necessary to complete the work in a perfect workmanlike manner in full compliance with the project graphic drawings.

26.18. PK01 – Shatterproof video intercom stand

Supply and installation of a shatterproof video intercom stand, having the following characteristics:
- size: 4400x400x1629 mm, see project drawing;
- video camera, photocell, intercome.
- RAL 7046 grey paint to be sampled for approval by D.L.

Equipped with a plate with a 400x400x10mm base for fixing by bolts and M12 chemical plugs to the building context.

The price includes and compensates the charges for fastening or grouting elements and any filling of frame compartments, surveys, inspections and measurements, for mechanisms and special accessories; for the suitable complete sampling of accessories that the Contractor must present before the start of the works, the Certification of doors for external use, compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

26.19. GT01 – Metal sliding gate with automatic opening type FAAC 844 ER, dimensions 350x350cm - GANTRY

Supply and installation of a metal gate with automatic opening type FAAC 844 ER, having the following characteristics:
- Number of doors: single
- Opening type: sliding
- Opening system: automatic
- size: 350x350cm
- Door type: metal with vertical bars
- perimeter load-bearing frame in hot-dip galvanized steel profiles with square section sized by the contractor
- complete with manual lock and ground sliding guides
- all the elements are painted, by laying anti-rust and epoxy powder coating with COR-TEN type finish to be sampled for approval by the D.L.

Automation for sliding gate type FAAC 844 ER with 230 V ac motor, double-disc clutch in oil bath with encoder and magnetic limit switch for anti-crushing function for intensive use for gates weighing

up to 1800 kg and handling speed not less than 9m/min. Electronic control board incorporated in the automation.

The price includes and compensates the costs for the installation of a suitable metal carpentry support structure, fasteners between the parts and to the existing structure and/or flooring, restoration of existing flooring, opening elements (hinges, locks, guides, etc.), accessories as per the abacus, special pieces, cuts, scraps, worktops for any height from the underlying support surface, protections, unloading of material, handling on site, removal of waste materials, final cleaning, masonry assistance the Certification of doors for outdoor use, compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner in full compliance with the project graphic drawings.

26.20. GT02 – Metal sliding gate with automatic opening type FAAC 844 ER, dimensions 350x240cm – ENTRANCE TO THE SITE

Supply and installation of a metal gate with automatic opening type FAAC 844 ER, having the following characteristics:
- Number of doors: single
- Opening type: sliding
- Opening system: automatic
- size: 350x240cm
- Door type: metal with vertical bars
- perimeter load-bearing frame in hot-dip galvanized steel profiles with square section sized by the contractor
- complete with manual lock and ground sliding guides
- all the elements are painted, by applying anti-rust and epoxy powder coating, RAL 7046 color to be sampled for approval by the D.L.

Automation for sliding gate type FAAC 844 ER with 230 V ac motor, double-disc clutch in oil bath with encoder and magnetic limit switch for anti-crushing function for intensive use for gates weighing up to 1800 kg and handling speed not less than 9m/min. Electronic control board incorporated in the automation.

Including supply and installation of VEK MNH1-R24-A traffic detector, with accessories such as connection terminals 1 for power supply, 1 loop, 2 relays.
Product Description: Inductive loop detectors and those used for traffic detection are
electronic sensors for the inductive detection of metal objects.
Vehicles can be detected by induction loops, for example, based on the device and its type of construction and direction of movement.
The detectors work in conjunction with various induction loops and controls, such as the frequency inverter or PLC controls.
For example, areas of application can be the detection, monitoring and counting of vehicles in the areas of transport technology, door or barrier controls, parking lot and tunnel monitoring, as well as signalling systems.

Including impulse controller system for special applications FAAC FG1 single-channel, FG2 two-channel, depending on the number of turns to be connected.

The price includes and compensates the costs for the installation of a suitable metal carpentry support structure, fasteners between the parts and to the existing structure and/or flooring, restoration of existing flooring, opening elements (hinges, locks, guides, etc.), accessories as per the abacus, special pieces, cuts, scraps, worktops for any height from the underlying support surface, protections, unloading of material, handling on site, removal of waste materials, final cleaning, masonry assistance the Certification of doors for outdoor use, compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner in full compliance with the project graphic drawings.

26.21. GT03 – Metal pedestrian gate with automatic swing opening type FAAC S800 ENC, dimensions 120x240cm

Supply and installation of a metal pedestrian gate with automatic swing opening type FAAC S800 ENC, having the following characteristics:
- Number of doors: single
- Opening type: Hinged
- Opening system: motorized
- Size: 120x240cm
- Door type: metal with vertical bars
- perimeter load-bearing frame in hot-dip galvanized steel profiles with square section sized by the contractor
- all the elements are painted, by laying anti-rust and epoxy powder coating with COR-TEN type finish to be sampled for approval by the D.L.

Automation for FAAC S800 ENC swing gate with 230 V ac motor, equipped with hydraulic technology with Absolute magnetic encoder and integrated 2Easy bus.
Self-supporting underground box for handling leaves up to 4m and maximum weight of 800 kg, complete with control unit, safety photocells and radio frequency control system.

The price includes and compensates the costs for the installation of a suitable metal carpentry support structure, fasteners between the parts and to the existing structure and/or flooring, restoration of existing flooring, opening elements (hinges, locks, guides, etc.), accessories as per the abacus, special pieces, cuts, scraps, worktops for any height from the underlying support surface, protections, unloading of material, handling on site, removal of waste materials, final cleaning, masonry assistance the Certification of doors for outdoor use, compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner in full compliance with the project graphic drawings.

26.22. GT04 – Metal pedestrian gate with automatic opening type FAAC S800 ENC, dimensions 140x240cm

Supply and installation of a metal pedestrian gate with automatic opening type FAAC S800 ENC, having the following characteristics:
- Number of doors: single
- Opening type: Hinged
- Opening system: motorized
- Size: 140x240cm
- Door type: metal with vertical bars
- perimeter load-bearing frame in hot-dip galvanized steel profiles with square section sized by the contractor
- all the elements are painted, by applying anti-rust and epoxy powder coating, RAL 7046 color to be sampled for approval by the D.L.

Automation for FAAC S800 ENC swing gate with 230 V ac motor, equipped with hydraulic technology with Absolute magnetic encoder and integrated 2Easy bus.
Self-supporting underground box for handling leaves up to 4m and maximum weight of 800 kg, complete with control unit, safety photocells and radio frequency control system.

The price includes and compensates the costs for the installation of a suitable metal carpentry support structure, fasteners between the parts and to the existing structure and/or flooring, restoration of existing flooring, opening elements (hinges, locks, guides, etc.), accessories as per the abacus, special pieces, cuts, scraps, worktops for any height from the underlying support surface, protections, unloading of material, handling on site, removal of waste materials, final cleaning, masonry assistance the Certification of doors for outdoor use, compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner in full compliance with the project graphic drawings.

26.23. GT08 – Revolving single turnstile with access for bikes

Supply and installation of external revolving turnstile at the entrance with bike access with the following features:
- Opening type: Simultaneous access for bicycles and people
- Movement system: Electromechanical turnstile, motorized passage
- Dimensions (LxWxH): 2500x2458x2235
- Flow (number of people per minute): 10
- Power supply voltage: 110-240 V AC, 50/60 Hz
- Structure: Hot-dip galvanized steel + powder coating in RAL7042 with stainless steel 316 bike guide element, prepared for inductive loops
- Access control system: Keydom system with FG1 Monochannel Detector, two-light LED traffic light, traffic light pole, LED traffic light pole support
- Bidirectional lock kit (entry side/exit side) to control the mechanical rotor lock in case of power interruption
- End passage display with a passage indicator, one per side, integrated into the top beam
- LED lighting for MPT 3 with MPG162/MPT5, composed of 4 lamps and support, powder-coated in RAL7042, with a twilight switch

- Foundation frame for MPB
- Mounting kit for foundation frame
- Integrated canopy with powder coating RAL7042 for MPB-A, roof panels (visible underside RAL9002/upper side RAL9006), front or rear slope, with gutter, without downspout, L (passage direction size) = 1667 mm, W = 2618 mm
- Housing for installation of intercom and/or access control unit, painted stainless steel RAL 7042, with mounting plate, packaging included.

Type, surface finish, dimensions, and color will be subject to approval by the DL/DA after sampling.

The price includes and compensates the costs for the installation of a suitable metal carpentry support structure, fasteners between the parts and to the existing structure and/or flooring, restoration of existing flooring, opening elements (hinges, locks, guides, etc.), accessories as per the abacus, special pieces, cuts, scraps, worktops for any height from the underlying support surface, protections, unloading of material, handling on site, removal of waste materials, final cleaning, masonry assistance the Certification of doors for outdoor use, compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner in full compliance with the project graphic drawings.

26.24. GT09 – Driveway access bar, width 350cm

Supply and installation of a crash-resistant vehicle access barrier, Gunnebo K12 (7t5 a 80 km/h) ALE AB-C80 4M50 type, with a straight bar for a width of 350 cm, installation with structure positioned according to the project specifications, painted steel IP54 box for outdoor and/or indoor use, integrable with an access control system, all subject to the approval of the Site Manager (D.L.). High-performance, high-speed automatic barrier, with the following general characteristics:The opening and closing of the gate are extremely fast and can be adjusted from 0.9 to 10 seconds, depending on the vehicle passage and the length of the arm.Includes a metal mass detector for inductive loop sensor..

The price includes and compensates the costs for the installation of a suitable metal carpentry support structure, fasteners between the parts and to the existing structure and/or flooring, restoration of existing flooring, opening elements (hinges, locks, guides, etc.), accessories as per the abacus, special pieces, cuts, scraps, worktops for any height from the underlying support surface, protections, unloading of material, handling on site, removal of waste materials, final cleaning, masonry assistance the Certification of doors for outdoor use, compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner in full compliance with the project graphic drawings.

26.25. NIM10 – Induction loop detector

Supply and installation of Induction loop detector, laid spaced at least 15cm from fixed metal objects, at least 50cm from moving metal objects and not more than 5cm from the surface of the final flooring. Perform a vacuum preferably square or rectangular.
The price includes and compensated restorations of existing flooring, accessories such as abacus,

protections, unloading of material, handling on site, clearing of materials, final cleaning and everything else necessary to give the finished work to perfection in full respect of the graphic design.

26.26. RL01 – External fence H 240cm

Supply and installation of an external fence made of galvanized steel with vertical bars, height H 240cm, fixed to the continuous foundation at the expense of the Structures Project, see reference drawings.
All the elements are painted, by applying anti-rust and epoxy powder coating, RAL 7046 color to be sampled for approval by the D.L.

The price includes and compensates: the costs for the installation of a suitable metal carpentry support structure, fasteners between the parts and to the existing structure and/or flooring, restoration of existing flooring, opening elements (hinges, locks, guides, etc.), accessories as per the schedule, special pieces, including the cutting of the elements according to the project configuration, welding, plates, dowels, plates, bolts, various hardware, worktops for any height from the underlying support surface, protections, material unloading, handling on site, removal of waste materials, final cleaning, masonry assistance the Certification of doors for outdoor use, compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the work finished in a workmanlike manner in full compliance with the project graphic drawings.

26.27. RL03 – Round tubular handrail for interiors

Supply and installation of indoor handrails made of tubular metal, diameter 30mm or similar, painted gray RAL 7046 to be sampled for approval by the D.L., welded to brackets with a circular section with a diameter of 10mm fixed to the building context (existing wall), 150cm pitch to be verified and submitted to the approval of the D.L.
Laid at an H of 110cm from the floor level, see the project drawing, at a distance of 60 mm from the internal surface of the wall for perfect gripping.

The price includes and compensates for the costs for the survey, the sizing of all the elements that make up the parapet and handrail, the drafting of the executive drawings to be submitted to the approval of the D.L., the static verification, the Certifications for pushing the crowd and falling into the void, the installation in safety according to project shapes, the sealing of the glazed parapet and the leg loop, compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

26.28. RL05 – Outdoor railing, 110 cm high from the ground, with a tubular handrail and wall-mounted supports at 50 cm intervals

Supply and installation of an outdoor railing, 110 cm high, made of metal with a rectangular handrail and square supports at 50 cm intervals. RAL 7046 color of choice by the DL.
The price includes and compensates for the costs for the survey, the sizing of all the elements that make up the parapet and handrail, the drafting of the executive drawings to be submitted to the approval of the D.L., the static verification, the Certifications for pushing the crowd and falling into

the void, the installation in safety according to project shapes, the sealing of the glazed parapet and the leg loop, compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

26.29. RL06 - Shatterproof external fence

Supply and installation of fencing in shatterproof external palisade, fixed on a concrete curb, made of galvanized steel, with triple tip top, height H 130cm, total height (including concrete curb H 240cm).
All the elements are painted, by applying anti-rust and epoxy powder coating, RAL 7046 color to be sampled for approval by the D.L.

The price includes and compensates: the costs for the installation of a suitable metal carpentry support structure, fasteners between the parts and to the existing structure and/or flooring, restoration of existing flooring, opening elements (hinges, locks, guides, etc.), accessories as per the schedule, special pieces, including the cutting of the elements according to the project configuration, welding, plates, dowels, plates, bolts, various hardware, worktops for any height from the underlying support surface, protections, material unloading, handling on site, removal of waste materials, final cleaning, masonry assistance the Certification of doors for outdoor use, compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the work finished in a workmanlike manner in full compliance with the project graphic drawings.

26.30. RL07 – Safety barrier H 110cm

Supply and installation of a 110cm H safety barrier with a diameter of 17cm and 5cm for protection from internal traffic such as Kingspan KPSDoubleBarrierRail-H.
The double barrier safety rail with a diameter of 170mm protects pedestrians and employees as they cross the workplace.
It is designed to protect pedestrians from the dangers of forklifts and other moving machines. Ideal for businesses with low traffic levels.

- Manufactured with high-performance synthetic polymer protection technology
- Features FLEXsafeTM protection technology designed to safely deflect and absorb impacts

RAL 7046 colour to be sampled for approval by D.L.

The price includes and compensates for the costs for the installation of a suitable metal carpentry support structure, fasteners between the parts and to the existing structure and/or flooring, restoration of existing flooring, opening elements (hinges, locks, guides, etc.), accessories as per the abacus, special pieces, including the cutting of the elements according to the project configuration, welding, plates, dowels, plates, bolts, various hardware, worktops for any height from the underlying support surface, protections, material unloading, handling on site, removal of waste materials, final cleaning, masonry assistance the Certification of doors for outdoor use, compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the work finished in a workmanlike manner in full compliance with the project graphic drawings.

26.31. SH14 – Metal flashing for perimeter wall on roof, width 45cm

Supply and installation of galvanized steel drip edges, up to 45 cm in length, for perimeter wall on roof, with drip edge.
The price includes and compensates for surveys, site inspections, and measurements, the supply of all necessary materials, transportation to the site, storage, and movement from the storage location to the work site, suitable fastening systems, special pieces, cutting, waste removal, overruns, any specific solutions at structural joints and system passages, cleaning and removal of waste materials, sorting and differentiation of the waste, and disposal at the landfill, all inclusive. All in accordance with the specifications in the project drawings, compliance with CE marking, and the Declaration of Performance (DOP) for construction products as required by Regulation No. 305/2011 (EU), and any other necessary measures to ensure the finished work is of high quality.

26.32. SH15 – Wall flashing for doors made of high-quality galvanized sheet metal, 0.55mm thick

Supply and installation of wall flashing for doors made of high-quality galvanized sheet metal, with a thickness of 0.55 mm, coated with a glossy PE enamel, RAL 7046, with the following characteristics:
- Section lenght: 25 cm
- Length: equal to that of the doors where it is installed
- Thickness: 0.55 mm

Made of high-quality galvanized sheet metal, coated with a glossy PE enamel, RAL 7046, to be defined and sampled for approval by the Site Manager. Installed at the top of the door using an appropriate adhesive, and further secured with countersunk stainless steel screws.
The price includes and compensates for the costs for installation according to project templates, cutting and trimming, adhesive for securing the profile, compliance with the CE marking and DOP for construction products as required by Regulation No. 305/2011 (EU), and any other work necessary to complete the project to the highest standard.

26.33. PK05 – Outdoor bike rack

Supply and installation of an outdoor rack, model and type to be defined and submitted to the approval of the D.L., to allow the parking of about 10 bicycles.
The price includes and compensates for the costs for installation, fasteners between the parts and to the existing structure and/or flooring, restoration of existing flooring, special pieces, plate, dowels, plates, bolts, various hardware, protections, unloading of material, handling on site, removal of waste materials, final cleaning, masonry assistance and Certification of doors for outdoor use, compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner in full compliance with the project drawings.

26.34. PK06 – Security bollard guard post

Supply and installation of metal bollards filled with concrete with the following characteristics:
- dimension: minimum height 90 cm, post diameter 15,2 cm, footing diameter 30,5 cm extending 15,2 cm below the bollard base.

Including all the processes, accessories, fittings, supports to give the finished product and working to perfection.

The price includes and compensates for the costs for the installation of a suitable metal carpentry support structure, fasteners between the parts and to the existing structure and/or flooring, restoration of existing flooring, opening elements (hinges, locks, guides, etc.), accessories as per the abacus, special pieces, including the cutting of the elements according to the project configuration, welding, plates, dowels, plates, bolts, various hardware, worktops for any height from the underlying support surface, protections, material unloading, handling on site, removal of waste materials, final cleaning, masonry assistance the Certification of doors for outdoor use, compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the work finished in a workmanlike manner in full compliance with the project graphic drawings.

26.35. PK07 – Tubular guides on the loading bay ramp

Supply and installation of tubular guides for trucks, positioned on the ramp of the loading bay, having the following characteristics:
Dimensions: diameter 160mm, length 1900mm.

The price includes and compensates for the costs for the installation of a suitable metal carpentry support structure, fasteners between the parts and to the existing structure and/or flooring, special pieces, including the cutting of the elements according to the design configuration, welding, plate, dowels, plates, bolts, various hardware, worktops for any height from the underlying support surface, protections, unloading of material, handling on site, removal of waste materials, final cleaning, masonry assistance the Certification of doors for outdoor use, compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner in full compliance with the project graphic drawings.

26.36. PK08 – Wheel stop for trucks on the loading bay ramp

Supply and installation of wheel stops for trucks on the loading bay ramp, having the following characteristics:
Dimensions: L 1220 x D 150 x H 100mm.

The price includes and compensates for the costs for the installation of a suitable metal carpentry support structure, fasteners between the parts and to the existing structure and/or flooring, special pieces, including the cutting of the elements according to the design configuration, welding, plate, dowels, plates, bolts, various hardware, worktops for any height from the underlying support surface, protections, unloading of material, handling on site, removal of waste materials, final cleaning, masonry assistance the Certification of doors for outdoor use, compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner in full compliance with the project graphic drawings.

26.37. NIM07 - Aluminium sign fixed to the façade

Supply and installation of sign and logo to be placed on the façade and as described in the project graphics, estimated dimensions height H 104cm x length L 469cm, consisting of pre-painted box sheet letters dowelled to the building context, consisting of:
- Load-bearing frame in metal carpentry constituting the skeleton of the letters and logo;
- Metal plates placed behind the load-bearing frame for anchoring to the façade building context;
- Painted aluminium box to form the letters and logo of the sign, sheet thickness to be defined and sampled for approval by the D.L., shaped to form the inscription "STACK INFRASTRUCTURE". Colours to sample: DARK BLUE PANTONE 7686C PLUS / MP 84158 and LIGHT BLUE PANTONE 4171C PLUS / MP 84990;
- use HILTI stainless steel dowels and screws;
- On-site transport, lifting and installation of the elements.

Included in the supply are the structural works aimed at supporting the sign itself and its anchoring to the existing structure, as well as the sizing of the anchors by a qualified technician.
The price includes and compensates for the analyses necessary for the construction of the work, the surveys of the existing, the sampling of the elements, the necessary certifications issued by the supplier and anything else necessary to give the finished work in a workmanlike manner.

26.38. NIM08 - Ground-mounted aluminium sign

Supply and installation of sign and logo to be placed on the ground and as described in the project drawings, estimated dimensions of the panel height H 81cm x length L 269cm, thickness 15cm, on which the letters and logo made of pre-painted box sheet metal will be fixed on both sides, consisting of:
- Load-bearing frame in metal carpentry constituting the skeleton of the panel, to be sized at the expense of the Contractor and submitted to the approval of the D.L. Including foundation piles in square boxes size 80x80mm, thickness 5mm, embedded in cast-in-situ plinths, to be sized at the expense of the Contractor;
- Covering of the substructure in carpentry, in brushed aluminum sheet pre-painted in DARK GREY COLOR (SW 7074 SOFTWARE), thickness to be defined and submitted to the approval of the D.L.
- Frame in light metal carpentry constituting the skeleton of the letters and logo, including metal plates placed behind the frame for fixing to the panel;
- Painted aluminium box to form the letters and logo of the sign, sheet thickness to be defined and sampled for approval by the D.L., shaped to form the inscription "STACK INFRASTRUCTURE". Colours to be sampled: DARK BLUE PANTONE 7686C PLUS / MP 84158 and LIGHT BLUE PANTONE 4171C PLUS / MP 84990, letter depth 40mm, to be fixed at a distance of about 40mm from the back panel;
- On-site transport, lifting and installation of the elements.

Included in the supply are the structural works aimed at supporting the sign itself and its anchoring to the existing structure, as well as the sizing of the anchors by a qualified technician.
The price includes and compensates for the analyses necessary for the construction of the work, the surveys of the existing, the sampling of the elements, the necessary certifications issued by the supplier and anything else necessary to give the finished work in a workmanlike manner.

27. EXTERNAL AND INTERNAL DOORS

27.1. Metal doors

27.2. Reference legislation

- UNI EN 1363-1:2020 Fire resistance tests – Part 1: General requirements
- UNI EN 15269-2:2012 Extended application of the results of fire resistance tests and/or smoke dispersion control for doors, closing systems and openable windows and their construction components – Part 2: Fire resistance of steel doors on hinges or pins
- UNI EN 1634-1:2018 Fire resistance and smoke dispersion control tests for doors and closing systems, opening windows and their construction accessories – Part 1: Fire resistance tests for doors and closing systems and opening windows
- UNI EN 1634:2014 Pedestrian doors, industrial, commercial, garage doors and opening windows – Product standard, performance characteristics – Fire resistance and/or smoke control characteristics
- UNI EN 1935:2004 Accessories for windows and doors – Single axis hinges – Requirements and test methods
- UNI EN 179:2008 Accessories for windows and doors – Emergency exit devices operated by lever handle or push plate for use on escape routes – Requirements and test methods
- UNI EN 1125:2008 Accessories for windows and doors – Panic exit devices operated by means of a horizontal bar for use on escape routes – Requirements and test methods
- UNI EN 1154:2003 Accessories for doors and windows – Controlled door closing devices – Requirements and test methods
- UNI EN 1155:2003 Accessories for windows and doors – Electromagnetic door stop devices for revolving doors – Requirements and test methods
- UNI EN 1158:2003 Accessories and windows – Devices for the coordination of the door closing sequence – Requirements and test methods
- UNI 11473-1:2013 Fire-resistant doors and windows and/or for smoke dispersion control – Part 1: Requirements for the provision of the installation and maintenance service
- UNI EN 12209:2016 Accessories for windows and doors – Mechanically operated locks and locking plates – Requirements and test methods

PLEASE NOTE: THE DIMENSIONS INDICATED OF THE DOORS ALWAYS REFER TO THE CLEAR PASSAGE OF THE DOOR OPENING.

27.3. MD01, MD02 - Metal doors for interiors with single leaf hinged door

Supply and installation as indicated in the project drawings, of metal doors for interiors, entirely galvanized, including hidden parts, type Ninz or similar to be submitted to the approval of the D.L., consisting of:
Frame made of hot-dip galvanized sheet steel Sendzimir system, equipped with seat for rebate gasket, suitable for fixing to the masonry by means of anchors or plasterboard plugs, assembled for single-leaf doors.
Detachable casing for support on finished floor.
Door consisting of two sheets of galvanized and pre-painted 6/10 sheet metal in RAL 7046 color to be sampled for approval by the D.L.
Boxed sheets edged longitudinally by a silver anodized aluminum profile.
Internal insulation in narrow-cell honeycomb cardboard constitutes a single monolithic block with the external sheets by hot gluing of polyurethane glues.
Silver anodized aluminum hinges with self-lubricating nylon bushing and steel pin, adjustable on two Cartesian axes.
Standard lever handle placed at a height of 960 mm as per DPR of 24/07/96
Pre-assembled neoprene rubber perimeter stop gasket.
Finishing of all metal parts, by painting with epoxy-polyester powders thermoset in an oven at 180°C, RAL 7046 color to be sampled for approval by the D.L.

Single leaf hinged door size:
- MD01: 80x210cm
- MD02: 90x210cm

The price includes and compensates for the costs for surveys, inspections and measurements, the installation of the door in the building context, the appropriate complete sampling of accessories that the Contractor must present before the start of the works, compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

27.4. MD04, MD10 - Metal doors for exteriors with single or double swing leaf installed on noise barrier (CW01), Rw = 30dB

Supply and installation of metal doors for exteriors on noise barrier (CW01) and as indicated in the project drawings, certified with acoustic tightness Rw = 30dB, Bosco type or similar to be submitted to the approval of the D.L., consisting of:
Frame in galvanized steel profile th. mm 15/10 "Z" profile, shaped in such a way as to allow coplanarity with the frame leaf, with a compartment for inserting the thermo-spreading gasket, equipped with holes for fixing on the pre-casing or with wall anchors.
The frame is joined to the corners by means of an exclusive interlocking system which, in addition to ensuring excellent rigidity, avoids the corrosion triggers typical of welds.
Leaf coplanar to the frame made of double galvanized steel sheet th. 9/10 mm press-bent, boxed, electro-welded, with high-density insulating internal pack and protected in the lock area with two layers of calcium sulphate-based material.
N° 2 hinges per leaf made of pressed steel with sliding on double ball bearing, sized for intensive traffic and in conditions of high loads. Their construction allows the position of the door to be adjusted

at any time by means of special screws which, under normal conditions, are covered from view by special snap inserts.
Closing mechanism by means of a special spring inserted in the hinges, which can be calibrated and invisible on the outside.
Sealing bolt placed between the two hinges.
Fire-resistant type lock complete with cylinder with three keys.
Black PVC handle with steel core, "U" shaped against accidental handholds, complete with European code cylinder with three keys.
Thermo-expanding gasket placed on the frame on the perimeter.
Surface finish with standard embossed epoxy-polyester powder, RAL 7046 colour to be sampled for approval by the D.L.
The particular construction allows a perfect coplanarity between the door and the frame, moreover, the rebate wing has a thickness of 19 mm in order to minimize the risk of accidents in the event of a collision with people.
The handle is placed at a height of 950 mm from the floor.
The door needs to install a steel floor threshold about 100mm wide.

Port size:
- MD04: 90x210cm with single hinged door;
- MD10: (90+90) 180x240cm.

The price includes and compensates for the costs for surveys, inspections and measurements, the installation of the door in the building context, the appropriate complete sampling of accessories that the Contractor must present before the start of the works, compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

27.5. MD03, MD19 - EI60 metal doors for indoor use with single leaf hinged door

Supply and installation of insulating fire doors with single swing leaf, in possession of full **EI60** approval as required in the project, according to UNI EN 1634-1:2001 standard, Ninz type or similar, duly certified by the Contractor and accepted by the D.L., made of steel, consisting of:
Fixed frame in galvanized steel profile 15/10 mm thick Z-profile, shaped in such a way as to allow the coplanarity of the door and frame, equipped with anchors for masonry, or dowels or screws for installation on a false plasterboard frame, suitably anchored to the wall structure in order to guarantee stability and tightness of the entire window, frame junction at the corners, by means of an interlocking system to avoid corrosion typical of welds and ensure rigidity.
Black plastic strikers for lock latch bolt and bolts, compartment for inserting cold smoke gasket.
EPDM heat-spreading gaskets, placed on the perimeter frame and mounted above and below the leaves according to certification;
Leaf coplanar with the frame made of double galvanized steel sheet press-bent, boxed, electro-welded in points; perimeter stop on 3 sides, flat underneath.
Internal reinforcements in hot-dip galvanized steel profile filled with treated mineral wool insulation, high density and rigidly joined to the sheet metal, protected in the lock area with two layers of

calcium sulphate-based material; internal plates for the possible installation of door closers and handles. Unique thickness of 64 mm.
Lower stop of the frame adaptable to the finished floor, or dismountable, for execution without stop.
Manoeuvring and locking hardware with characteristics and qualities suitable for the use for which it is intended, consisting of:
2 hinges with three wings, one of which is load-bearing, equipped with thrust balls and screws for vertical adjustment of the leaf, marked according to EN 1935, classified for load capacity up to 160 kg, durability 200,000 cycles, suitable for use on fire doors.
Closing mechanism by means of a special spring inserted in the hinges, adjustable and invisible on the outside.
Sealing bolt placed between the two hinges;
Standard lever handle, brand and model to be defined and sampled for approval by the D.L.
Marking plate with reference elements, rebated to the door.
Finish by standard painting with epoxy-polyester powders thermoset in an oven at 180°, surface with scratch-resistant embossed structure RAL 7046 color to be sampled for approval by the D.L.

Single leaf hinged door size:
- MD03: 90x210cm
- MD19: 120x240cm

Realization of possible filling with mortar of the interstice of the iron frame to guarantee the required performance and on the manufacturer's indication in compliance with the legislative provisions for obtaining the aforementioned **EI60** certification as required.
The price includes and compensates for the costs for the special mechanisms and accessories necessary for adaptation to the various types of doors, for the suitable complete sampling of accessories that the Contractor must present before the start of the works, the charges for the certification of **EI60 metal doors** as required in the project, as well as compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by the Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

27.6. MD05, MD06, MD09 - EI60 metal doors for outdoor use with single or double swing leaf

Supply and installation of external insulating fire doors, with single or double swing leaf, in possession of full **EI60** approval as required in the project, according to UNI EN 1634-1:2001 standard, CE marked according to EN 14351-1:2016, Ninz type or similar, duly certified by the Contractor and accepted by the D.L. made of steel, consisting of:
Fixed frame in galvanized steel profile 15/10 mm thick Z-profile, shaped in such a way as to allow the coplanarity of the door and frame, equipped with anchors for masonry, or dowels or screws for installation on a false plasterboard frame, suitably anchored to the wall structure in order to guarantee stability and tightness of the entire window, frame junction at the corners, by means of an interlocking system to avoid corrosion typical of welds and ensure rigidity. Black plastic strikers for lock latch bolt and bolts, compartment for inserting cold smoke gasket.

EPDM heat-expanding gaskets, placed on the perimeter frame and mounted above and below the leaves according to certification.
Leaf coplanar with the frame made of double galvanized steel sheet press-bent, boxed, electro-welded in points; perimeter stop on 3 sides, flat underneath.
Internal reinforcements in hot-dip galvanized steel profile filled with treated mineral wool insulation, high density and rigidly joined to the sheet metal; protected in the lock area with two layers of calcium sulphate-based material; internal plates for possible installation of door closers and handles
- Single thickness of 64 mm
Lower stop of the frame adaptable to the finished floor, or dismountable, for execution without stop.
Manoeuvring and locking hardware with characteristics and qualities suitable for the use for which it is intended consisting of:
2 three-wing hinges, per door; one of which is load-bearing, equipped with thrust balls and screws for vertical adjustment of the leaf, marked according to EN 1935, classified for load capacity up to 160 kg, durability 200,000 cycles, suitable for use on fire doors.
The other, equipped with a spring for self-closing the door.
Closing mechanism by means of a special spring inserted in the hinges, adjustable and invisible to the outside
Sealing bolt placed between the two hinges;
Installation of standard handle complete with plate, brand to be defined and sampled for approval of the D.L. placed at a height of 960 mm as per Presidential Decree of 24/07/96;
Marking plate with reference elements, rebated to the door.
Finish by standard painting with epoxy-polyester powders thermoset in an oven at 180°, surface with scratch-resistant embossed structure, RAL 7046 colour to be sampled for approval by the D.L.

Single leaf door size:
- MD05: 120x240cm
- MD06: 120x260cm

Double leaf door size:
- MD09: (90+90) 180x240cm

EI doors must also be certified for outdoor use or either for:
- Wind load resistance and water tightness
- Thermal insulation
- Air permeability

Realization of possible filling with mortar of the interstice of the iron frame to guarantee the required performance and on the manufacturer's indication in compliance with the legislative provisions for obtaining the aforementioned certification for **EI60** external metal doors as required
The price includes and compensates for the costs for the mechanisms and special accessories necessary for adaptation to the various types of doors, for the suitable complete sampling of accessories that the Contractor must present before the start of the works, compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by

Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

27.7. MD11 - Metal doors for interiors with double hinged leaf

Supply and installation as indicated in the project drawings, of metal doors for interiors with double swing leaf, type Meverin or similar to be submitted to the approval of the D.L., entirely galvanized, including the hidden parts, consisting of:
Frame made of hot-dip galvanized sheet steel Sendzimir system, equipped with seat for rebate gasket, suitable for fixing to the masonry by means of anchors or plasterboard plugs, assembled for single-leaf doors.
Detachable casing for support on finished floor.
Door consisting of two sheets of galvanized and pre-painted 6/10 sheet metal in RAL 7046 color to be sampled for approval by the D.L.
Boxed sheets edged longitudinally by a silver anodized aluminum profile.
Internal insulation in narrow-cell honeycomb cardboard constitutes a single monolithic block with the external sheets by hot gluing of polyurethane glues.
Manoeuvring and locking hardware with characteristics and qualities suitable for the use for which it is intended consisting of: 2 hinges with three wings (per leaf), one of which is load-bearing, equipped with thrust balls and screws for vertical adjustment of the leaf, marked according to EN 1935, classified for load capacity up to 160 kg, durability 200,000 cycles, suitable for use on fire doors.
The other, equipped with a spring for self-closing the door.
Closing mechanism by means of a special spring inserted in the hinges, adjustable and invisible on the outside.
Standard lever handle complete with black plate, brand to be defined and sampled for approval by the D.L., placed at a height of 960 mm as per Presidential Decree of 24/07/96
Pre-assembled neoprene rubber perimeter stop gasket.
Finishing of all metal parts, by painting with epoxy-polyester powders thermoset in an oven at 180°C, in RAL 7046 color to be sampled for approval by the D.L.

Double leaf hinged door size:
- MD11: (90+90) 180x305cm

The price includes and compensates for the costs for surveys, inspections and measurements, the installation of the door in the building context, the appropriate complete sampling of accessories that the Contractor must present before the start of the works, compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

27.8. MD12, MD13, MD14 - EI60 metal interior doors with double leaf hinged door

Supply and installation of insulating fire doors with one or two swing leaves in possession of full **EI60** approval as required in the project, according to UNI EN 1634-1:2001 standard, Meverin type or similar, duly certified by the Contractor and accepted by the D. L., made of steel, consisting of:
Fixed frame in galvanized steel profile 15/10 mm thick Z-profile, shaped in such a way as to allow the coplanarity of the door and frame, equipped with anchors for masonry, or dowels or screws for

installation on a false plasterboard frame, suitably anchored to the wall structure in order to guarantee stability and tightness of the entire window, frame junction at the corners, by means of an interlocking system to avoid corrosion typical of welds and ensure rigidity.
Black plastic strikers for lock latch bolt and bolts, compartment for inserting cold smoke gasket.
EPDM heat-spreading gaskets, placed on the perimeter frame and mounted above and below the leaves according to certification;
Leaf coplanar with the frame made of double galvanized steel sheet press-bent, boxed, electro-welded in points; perimeter stop on 3 sides, flat underneath.
Internal reinforcements in hot-dip galvanized steel profile filled with treated mineral wool insulation, high density and rigidly joined to the sheet metal, protected in the lock area with two layers of calcium sulphate-based material; internal plates for the possible installation of door closers and handles. Unique thickness of 64 mm.
Lower stop of the frame adaptable to the finished floor, or dismountable, for execution without stop.
Manoeuvring and locking hardware with characteristics and qualities suitable for the use for which it is intended, consisting of:
2 hinges with three wings (per leaf), one of which is load-bearing, equipped with thrust balls and screws for vertical adjustment of the leaf, marked according to EN 1935, classified for load capacity up to 160 kg, durability 200,000 cycles, suitable for use on fire doors.
The other, equipped with a spring for self-closing the door.
Closing mechanism by means of a special spring inserted in the hinges, adjustable and invisible on the outside.
Sealing bolt placed between the two hinges;
"Flush-bolt" type counterlock for self-locking of the passive leaf and lever control for unlocking for double-leaf swing doors;
Upper and lower hooking system of the passive leaf for double-leaf hinged doors.
Installation of standard lever handles complete with plate, model to be defined and sampled for approval of the D.L. placed at a height of 960 mm as per Presidential Decree of 24/07/96.
Marking plate with reference elements, applied to the door when rebated;
Finish by standard painting with epoxy-polyester powders thermoset in an oven at 180°, surface with scratch-resistant embossed structure RAL 7046 color to be sampled for approval by the D.L.

Double leaf hinged door size:
- MD12: (90+90) 180x280cm
- MD13: (75+75) 150x240cm
- MD14: (90+90) 180x305cm

Realization of possible filling with mortar of the interstice of the iron frame to guarantee the required performance and on the manufacturer's indication in compliance with the legislative provisions for obtaining the aforementioned **EI60** certification as required.
The price includes and compensates for the costs for the special mechanisms and accessories necessary for adaptation to the various types of doors, for the suitable complete sampling of accessories that the Contractor must present before the start of the works, the charges for the certification of **EI60 metal doors** as required in the project, as well as compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by the

Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

27.9. MD17, MD18 - Metal doors with double leaf hinged doors

Supply and installation of metal doors certified for outdoor use, with environmental characteristics according to EN 14351-1, fully galvanized, including hidden parts, such as Meverin or similar, duly certified by the Contractor and accepted by D.L.
Built with hot-dip galvanized sheet metal, "Sendzimir" system, protected from corrosion even in the cut edges of the sheet metal; with excellent corrosion resistance demonstrated by 500-hour salt spray tests and inalterability to strong climatic variations, demonstrated by 2000-hour tests with cycles from +60° to -10° and 75% humidity; consisting of:
Frame for single-leaf doors made of hot-dip galvanised sheet steel "Sendzimir" system with seats for rebate gasket, suitable for fixing to masonry by means of clamps;
Detachable casing for support on finished floor;
Crossbar to be removed for execution without rebate (except for marked exterior doors)
Black plastic strike plate for latch lock
Leaf coplanar with the frame made of double hot-dip galvanized steel sheet 8/10 press-bent, boxed, electro-welded in points; perimeter stop on 4 sides, with inserted insulating pack made of mineral wool.
Internal plates for the installation of door closers and panic bars.
Door thickness 64mm.
Lower stop of the frame adaptable to the finished floor, or removable, for execution without stop;
Nr. 2 hinges with three wings per door, one of them load-bearing equipped with thrust balls and screws for vertical adjustment of the door, marked according to EN 1935, classified for load capacity up to 160 kg, durability 200,000 cycles; the other equipped with a spring for self-closing the door.
Sealing bolt placed between the two hinges.
Standard lever handle complete with plate in the type and color to be sampled for approval of the D.L. placed at a height of 960 mm as per Presidential Decree of 24/07/96
Marking plate with reference elements, rebated to the door.
Finishing of all metal parts, by painting with epoxy-polyester powders thermoset in an oven at 180° with considerable thickness of the paint layer (over 70 microns), scratch-resistant embossed finish, RAL 7046 color to be sampled for approval by the D.L.

On a project basis, we distinguish:

- MD17: (90+90) 180x240cm
- MD18: (90+90) 180x280cm

The doors must be certified for outdoor use or either for:

- Wind load resistance and water tightness
- Thermal insulation
- Air permeability

The price includes and compensates for the costs for fixing the door in the building context, the fixing or grouting elements and any filling of the frame compartments, surveys, inspections and measurements, for the mechanisms and special accessories necessary for adaptation to the various types of doors, for the suitable complete sampling of accessories that the Contractor must present before the start of the works, the Certification of doors for outdoor use, compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

27.10. MD07, MD08 – Roll-up door for loading bay, dimensions 250x305cm

Supply and installation, as indicated in the project drawings, of a roll-up door for intensive use, Kopron type model KV-WL Fast Wall, for loading bay, having the following characteristics:
Upper winding structure made with special side supports equipped with parachute and motor unit, large steel shaft where the insulated mantle is wrapped.
Guides made of galvanized sheet metal, suitably shaped for perfect sliding and a perfect mechanical seal for wind resistance.
Rigid membrane in sandwich elements 20mm thick is composed of pre-painted sheet metal with CFC-free polyurethane foam insulation with a density of 40kg/mc, thermal insulation equal to a value of 3.7W/sqmK. On the outside, the micro-diamond surface makes the door elegant and resistant, on the inside the surface is smooth ribbed.
Special nylon side glides keep the mantle aligned for perfect sliding of the side guides.
Motorization: heavy-duty gearmotor keyed directly to the shaft consisting of: electric motor of adequate power in version with oversized electric brake and special ecoender limit switch, coupled to a gearbox with worm screw with permanent lubrication, emergency crank release.
Electronic ecoender limit switch with digital adjustment directly from the control panel.
Control panel with programmable electronic technology and status display display, opening door complete with up-stop-down button, opening and closing speed adjustment, possibility of connecting all types of controls, automatic closing management, partial opening, fault reporting test and cycle counter with lock for assistance and maintenance.

On a project basis, we distinguish the following types:
- MD07: for internal loading bay
- MD08: for external loading bay

Including suitable door fixing/anchoring systems in the building context, for any type of masonry or plasterboard wall, work for door compartment adaptation (small demolitions, plaster and painting compensation), any frame compartment fillings, any finishing padding, architraves, seals, gaskets, any paddling to cover the wall opening, cuts, scraps, special pieces, for the suitable complete sampling of accessories that the Contractor must present before the start of the works, compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU), adaptations during construction, loading, unloading, handling on site, final cleaning, masonry assistance and any other work, charge and accessory necessary to give the work complete and finished in a perfect workmanlike manner in full compliance with the project graphic drawings.

27.11. MD08a – External tilting isothermal loading bay dock portal 340x350cm

Supply and installation of a tilting isothermal portal for external loading dock, type Kopron KDR-S, mounted to cover/seal an opening with a closure door, positioned approximately 1 meter above the ground. Made with a bearing frame anchored to the wall or other supports and a forward frame with a cantilever, in galvanized metal profile, connected by oscillating arms with an anti-shock system that allows the structure to compress without damage from incorrect vehicle maneuvers; the structure compresses without damage and automatically returns to the working position. Front flaps in abrasion-resistant PVC with differentiated weave - weight 3600 g/m², color BLACK/ANTRACITE RAL 7016, 3 mm thick, with very high resistance to impacts and tearing, reinforced with double tear-resistant fabric with differentiated weaves, designed to withstand bending and twisting stresses, complete with lateral indicator arrows for vehicle centering. Covering in polyester/PVC double-coated fabric, self-extinguishing, equipped with specific accessories for fastening to the metal structure. Includes rainwater drainage system. Installation included.
Width: 3400 mm
Height: 3500 mm
Depth: 650 mm
Covering color: LIGHT GREY
Flap color: ANTHRACITE/BLACK

The price includes supply, transport and installation, suitable fixing/anchoring systems for any type of masonry or plasterboard wall, work for doorway adjustment (small demolitions, plaster and painting compensation), any finishing upholstery, architraves, seals, trim, cuts, scraps, loading and unloading the door, handling at the construction site, final cleaning, masonry assistance as well as every work and activity, tools, respect to the CE marking and the Declaration of Production of PDO Product for construction products provided for by Regulation No. 305/2011 (EU) and everything necessary to completely fulfil standards and regulations.

27.12. Door accessories

Supply and installation of the following accessories according to project indications, see table Abachi Porte:
AC-00: Installation on single-leaf doors of:
- Lock Type: 1 Point Mortise Standard Lock
- Door closer: Geeze TS 4000/1-6 (BS) silvercoloured
- Door opening: 90°

AC-02: Installation on single-leaf doors of:
- Electric lock:
- Security hardware (badge label): Card in/Free Out (CRI/RXO)
- Door closer: Geeze TS 4000/1-6 (BS) silvercoloured
- Door opening: 90°

AC-03: Installation on double-leaf doors of:
- Electric lock:

- Security hardware (badge label): Card in/Free Out (CRI/RXO)
- Door closer: Geeze TS 4000/1-6 (BS) silvercoloured on both leaves
- Door opening: 90°

AC-05: Installation on double-leaf doors of:
- Lock Type: 1 Point Mortise Standard Lock
- Cold smoke gasket on both doors
- Door closer: Geeze TS 4000/1-6 (BS) silvercoloured on both leaves
- Door opening: 90°

AC-10: Installation on double-leaf doors of:
- Electric lock
- Security hardware (badge label): Card in/Free Out (CRI/RXO)
- Cold smoke gasket on both doors
- Door closer: Geeze TS 4000/1-6 (BS) silvercoloured on both leaves
- Door opening: 90°

AC-11: Installation on double-leaf doors of:
- Electric lock
- Security hardware (badge label): Card In/Card Out (CRI-CRO) with EDR
- cold smoke gasket on both doors
- Door closer: Geeze TS 4000/1-6 (BS) silvercoloured on both leaves
- Door opening: 90°

AC-13: Installation on single-leaf doors (emergency exit) of:
- Electric lock
- peephole
- Security hardware (badge label): Card in/Free Out (CRI/RXO)
- Panic bar
- Door closer: Geeze TS 4000/1-6 (BS) silvercoloured
- Door opening: 90°

AC-14: Installation on single-leaf doors of:
- Lock Type: 1 Point Mortise Standard Lock
- Push-bar
- Smoke seal
- Door closer: Geeze TS 4000/1-6 (BS) silvercoloured on both leaves
- Door opening: 180°

AC-15: Installation on double-leaf doors of:
- Lock Type: 1 Point Mortise Standard Lock
- Door closer: Geeze TS 4000/1-6 (BS) silvercoloured on both leaves
- Door opening: 90°

AC-16: Installation on double-leaf doors of:

- Lock Type: 1 Point Mortise Standard Lock
- Door closer: Geeze TS 4000/1-6 (BS) silvercoloured on both leaves
- Door opening: 90°

AC-17: Installation on single-leaf doors of:
- Lock Type: 1 Point Mortise Standard Lock
- Door closer: Geeze TS 4000/1-6 (BS) silvercoloured
- Door opening: 90°

AC-19: Installation on single-leaf doors of:
- Electric lock
- Security hardware (badge label): Card In/Card Out (CRI-CRO) with EDR
- Door closer: Geeze TS 4000/1-6 (BS) silvercoloured
- Door opening: 90°

AC-20: Installation on double-leaf doors of:
- Electric lock
- Security hardware (badge label): Card In/Card Out (CRI-CRO) with EDR
- Door closer: Geeze TS 4000/1-6 (BS) silvercoloured on both leaves
- Door opening: 90°

AC-21: Installation on single-leaf doors of:
- Electric lock
- Security hardware (badge label): Card In/Card Out (CRI-CRO) with EDR
- Smoke seal
- Door closer: Geeze TS 4000/1-6 (BS) silvercoloured on both leaves
- Door opening: 90°

AC-22: Installation on double leaf doors of:
- Lock Type: 1 Point Mortise Standard Lock
- Door closer: Geeze TS 4000/1-6 (BS) silvercoloured on both leaves
- Door opening: 90°

AC-23: Installation on single-leaf doors of:
- Lock Type: 1 Point Mortise Standard Lock
- Cold fume gasket
- Door closer: Geeze TS 4000/1-6 (BS) silvercoloured
- Door opening: 90°

AC-24: Installation on single-leaf doors of:
- Lock Type: 1 Point Mortise Standard Lock
- Door closer: Geeze TS 4000/1-6 (BS) silvercoloured
- Panic bar
- Door opening: 90°

AC-25: Installation on single-leaf doors of:
- Electric lock
- Security hardware (badge label): Card in/Free Out (CRI/RXO)
- Cold fume gasket
- Door closer: Geeze TS 4000/1-6 (BS) silvercoloured
- Panic bar
- Door opening: 90°

AC-26: Installation on double-leaf doors of:
- Electric lock
- Security hardware (badge label): Card In/Card Out (CRI-CRO) with EDR
- Panic bar on both leaves
- Door closer: Geeze TS 4000/1-6 (BS) silvercoloured on both leaves
- Door opening: 90°

AC-27: Installation on single-leaf doors (emergency exit) of:
- Lock Type: 1 Point Mortise Standard Lock
- Panic bar
- Door closer: Geeze TS 4000/1-6 (BS) silvercoloured
- Door opening: 90°

AC-28: Installation on single-leaf doors of:
-pawl
- Lock Type: 1 Point Mortise Standard Lock
- Door closer: Geeze TS 4000/1-6 (BS) silvercoloured
- Door opening: 90°

AC-29: Installation on double-leaf doors (emergency exit) of:
- Electric lock
- Security hardware (badge label): Card in/Free Out (CRI/RXO)
- Panic bar on both leaves
- Door closer: Geeze TS 4000/1-6 (BS) silvercoloured on both leaves
- Door opening: 90°

AC-30: Installation on single-leaf doors of:
- Electric lock:
- Security hardware (badge label): Card in/Free Out (CRI/RXO)
- Cold fume gasket
-Door Closer: Geeze TS 4000/1-6 (BS) silvercoloured
- Door opening: 90°

28. WORKS BY TINSMITHIERE

28.1. Generality

The artifacts and works in general in sheet steel, zinc, copper, lead, brass, aluminum or other metals, must be of the required dimensions and shapes, worked with the utmost precision and to perfect finish.
Unless otherwise specified, these works will be carried out complete with all accessories necessary for their perfect functioning, as well as complete with special pieces and supports of all kinds.
The installation will also include all the necessary masonry services and again the complete work of protective painting, to be carried out according to prescription.
The joints of the pieces will be carried out by nailing, riveting, riveting, seaming, welding or with combined systems, on the basis of what is provided in particular by the Works Management and in accordance with the samples that must be presented for approval.

The Contractor will also be obliged to submit, at the request of the Works Management, the executive drawings of the various works, pipes, collection channels, etc., complete with the relevant verification calculations and to make, if necessary, any changes required at the time of prior acceptance.

28.2. Method of execution

For the supply and installation of any type of product and accessory, the Contractor must refer to the prospectuses, tables and details indicated in the drawings attached to this specification: they specify the type of finish, dimensions and characteristics of each type of material.
The materials of minor accessories, where not mentioned, will be defined during the construction site (workshop drawings) and subject to the approval of the Works Management.
The installation materials, if they are to be deposited on floors susceptible to subsequent processing, must be stacked on platforms and protected with waterproof sheets.
The start of the works and the various phases of execution must be agreed with the Contracting Authority to take into account the other activities that may be carried out at the same time.
At the end of each working day, and whenever work is interrupted due to bad weather or any other cause, the works already carried out, which are susceptible to damage, must be carefully protected from rain, from temperatures that are too low or too high and from the action of the wind. Materials and equipment should be neatly stacked so that they are not lifted by the wind.

28.3. Reference legislation

MATERIALS

- UNI EN 10143:2006 Thin sheets and strips of steel with continuous hot dip coating – Tolerances on size and shape
- UNI EN 10346:2015 Continuous hot-dip coated flat steel products for cold forming – Technical supply conditions
- UNI EN ISO 7823-2:2004 Plastics – Poly(methyl methacrylate) sheets – Types, dimensions and characteristics – Part 2: Extruded sheets
- UNI 7856:1978 Pig iron. Definition, classification and quality
- UNI EN 10088-1:2014 Stainless steels – Part 1: List of stainless steels

- UNI EN 10088-2:2014 Stainless steels – Part 2: Technical conditions for the supply of plates, sheets and strips of corrosion-resistant steel for general purposes
- UNI EN 10088-3:2014 Stainless steels – Part 3: Technical conditions for the supply of semi-finished products, bars, wire rod, wire, profiles and cold-processed products of corrosion-resistant steel for general purposes
- UNI EN 12163:2016 Copper and copper alloys – Bars for general purposes
- UNI 10372:2013 Discontinuous roofs - Instructions for the design, execution and maintenance of roofs made with metal sheet elements
- UNI EN ISO 17855-1:2014 Polyethylene (PE) materials for moulding and extrusion – Part 1: Designation system and basis for specifications
- ISO 17855-2:2016 Plastics – Polyethylene (PE) moulding and extrusion materials – Part 2: Preparation of test specimens and determination of properties
- UNI EN 10021:2007 General technical delivery conditions for steel products
- UNI EN 10204:2005 Metallic products – Types of inspection documents
- UNI EN 10027-1:2016 Steel designation systems – Part 1: Symbolic designation
- UNI EN 10027-2:2015 Steel designation systems – Part 2: Numerical designation
- UNI EN 10163-1:2005 Delivery conditions relating to the surface finish of hot-rolled steel sheets, wide flats and profiles – Part 1: General requirements
- UNI EN 10163-2:2005 Supply conditions relating to the surface finish of hot-rolled steel sheets, wide flats and profiles – Part 2: Flat sheets and wide sections
- UNI EN 10163-3:2005 Supply conditions relating to the surface finish of hot-rolled and hot-rolled steel sheets, wide flats and profiles – Part 3: Profiles
- UNI EN 10204:2005 Metal products - Types of control documents
- UNI EN 10020:2001 Definition and classification of steel grades
- UNI EN 10029:2011 Hot-rolled steel sheets with a thickness greater than or equal to 3 mm - Tolerances on dimensions and shape
- DIN EN 988 Zinc and zinc alloys - Specifications for zinc and zinc alloy rolled flat products for building

<u>TEST METHODS</u>

- UNI 558:1985 Mechanical tests of metallic materials. Compression test at room temperature
- UNI 4655:1987 Mechanical tests of non-ferrous metallic materials - Hot Brinell hardness test
- UNI 9159:1987 Mechanical tests of metallic materials. Determination of the displacement at the apex of a crack (COD)

- UNI 3964:1985 Mechanical tests of metallic materials. Fatigue tests at room temperature. General principles.
- UNI EN ISO 5178:2019 Destructive tests on welds of metallic materials – Longitudinal tensile test on welded metal in fusion welded joints
- UNI 8786:1985 Mechanical tests of metallic materials. Determination of the work hardening modulus no.
- UNI EN ISO 6892-1:2020 Metallic materials – Tensile testing – Part 1: Method of test at room temperature
- UNI EN ISO 6892-2:2018 Metallic materials – Tensile testing – Part 2: Method of test at elevated temperature
- UNI EN ISO 6506-1:2015 Metallic materials – Brinell hardness test – Part 1: Test method
- UNI EN ISO 6508-1:2016 Metallic Materials – Rockwell Hardness Test – Part 1: Test Method
- UNI EN ISO 6507-1:2018 Metallic materials – Vickers hardness test – Part 1: Test method

28.4. Acceptance Requirements

The Contractor, for each batch of materials that he will use in the preparation of the products, must provide the Works Management with the relative certificate of origin with the results of the tests to which they have been subjected in the factory or at Official Laboratories.
The Works Supervision and the Inspector reserve the right to have samples taken of materials to be tested according to the regulations. The related costs will be borne by the Contractor.

28.5. Performance Specifications

Contractor's charges and obligations included in the on-site supply
The Contractor shall provide all the services necessary to carry out the works carried out as specified in this specification and in the annexes. In particular, the Contractor shall be responsible for the following.
The supply and installation of all flashings, covers, valleys, flaps, joint covers made of copper sheet, stainless steel and other materials required by the project.
The supply and installation of downspouts and overflow drains made of copper and/or stainless steel according to the project requirements. Overflow discharges must be provided in a minimum number of one per section of the eaves.
The supply and installation of downpipes, etc., made according to the project requirements.
The supply and installation of leaf guard baskets and accessories.
Seals of any kind to ensure the watertightness of the artifacts among themselves and at the points of contact with the masonry works:
Connecting elements between horizontal surfaces and vertical surfaces to be made with shaped strips of insulating material, in the event that the connection is "not" already made with cement mortar shell;
Connecting elements with any gutters;
Connecting elements with any skylights and system holes (ventilation, extraction, etc.);

Inserts for the construction of expansion joints;
Where necessary, membrane fasteners at the flaps and flashings;
Aeration units of the vapour barrier or screen layer and the sealing element.
The control of the civil works in which the artifacts covered by this technical specification must be inserted.
Materials, equipment, including scaffolding and accident prevention equipment, the specialized and ordinary labor for the installation of the artifacts.
Fixed manager on site, accredited with decision-making powers, present for the entire period, from the arrival of the materials to the completion of the installation.
Transport, unloading, storage, protection and custody of materials on site, in environments prepared by the Contractor.
Rooms suitable for shelter, changing room, refectory, etc., for the Contractor's staff, as required by current health and safety regulations in the workplace.
The power lines from the on-site gripping points to the user tools.
The transport and lifting of materials from the construction site warehouse to the installation sites.
The transport from the places of installation and the stacking within the construction site, in a fenced area, previously indicated by the Works Management, of the resulting and waste materials. The transport of the same to the disposal places including all the related charges and practices.
The cleaning of the areas used for the stacking of materials and waste. This clause also applies to demolition and partial renovation of the works to be carried out after the deadline for the execution of the works and for the entire duration of the warranty.
Travel expenses, daily travel allowances, board and lodging, social security contributions and any other charge relating to the Contractor's personnel working on site.
The costs related to the execution of tests on samples of materials or artifacts.
The stacking of the products on the roof while waiting for their installation must not cause overload on the structure > 80 kg/sqm.
The Contractor will present an assembly plan in compliance with the regulations to be applied on safety in the workplace.

28.6. Sampling/testing methods

In general, the Contractor must submit for approval a double series of samples of the materials used and the most significant nodes of the products.
These samples must be approved by the Works Manager: one series will be kept by the Contractor and one series by the Contracting Authority.
Without written approval from the Contracting Authority, the works, both in the workshop and on site, cannot begin.

<u>Relating to individual components</u>
The Contractor must submit for approval a double series of samples of the materials used and the most significant nodes of the products.
These samples must be approved by the Works Management: one series will be kept by the Contractor and one series by the Client.
Without written approval from the Works Management, the works both in the workshop and on the construction site cannot begin.

Relating to components and systems in place
Where required by the project or by the Works Management, the approval of the samples referred to in the previous paragraph is in any case subject to the simultaneous approval of the components and systems made on site in order to assess the suitability and relationship between them.

28.7. Tests

During the course of the works, at the request of the Works Management, samples of the various materials will be taken to ascertain their compliance with this specification, according to the procedures established by the Tester, after consulting the Designer and the Works Management.
Testing of such samples will be performed as stipulated in the Agreement.
For sheet metal work in general, it will consist of verifying that any prescriptions made during the execution of the works or provisional testing have been complied with and that the works do not show any sign of degradation due to normal use.

28.8. Guarantees

The warranty, for the works covered by this technical specification, will last 10 years from the date of the final favorable test report. During this period, the Contractor will be required to carry out repairs and renovations that may be necessary due to poor execution or poor quality of the materials used and artifacts, free of charge, except for the compensation of damages for the restoration of buildings and interiors damaged by any infiltrations. If the repair and restoration works affect premises where production takes place, the warranty will also include compensation for damages relating to the shutdown of the same.
The Contractor, to cover the warranty period, will issue a specific insurance policy.

28.9. Workshop/construction drawings, "As built" drawings

The Contractor must draw up and submit the workshop/construction and installation drawings to the Works Management for approval, before any work begins.
In particular, the workshop drawings will be accompanied by construction details and must indicate the characteristics of the joints.
During the course of the works, the Contractor must update all the drawings according to what has actually been built and deliver them to the Works Management.
The Contractor, in addition to the workshop drawings, must provide an assembly diagram from which the reciprocal positions of the elements making up the structure are clearly shown. The various parts of the structures to be assembled must be marked with marks in specific and visible places. The same markings must be shown on the workshop drawings.
The Contractor may present any alternative proposals to those of the project during the workshop design. These solutions will be submitted to the Works Management for approval.
At the end of the works, the Contractor will prepare a file containing instructions for the maintenance of the products.

28.10. Construction site

Before the opening of the construction site, the areas for fixed installations, the needs of services and utilities, the storage area of materials, the accesses necessary for assembly, types, weights and load of self-propelled vehicles, etc., must be defined in time.
Upon arrival at the construction site, all materials, both single and composite, must have clearly visible workshop identification marks.
Particular care must be taken to avoid damage during unloading, handling and pulling up materials. During these operations, safety regulations must be scrupulously observed.
Materials of small use but necessary for assembly such as bolts, nuts, rosettes, etc., must be supplied with an adequate supply.

28.11. Materials

All materials must be of first commercial choice, free from defects that may compromise the quality, efficiency and durability of both the individual components and the works supplied.

Galvanized steel sheet and profile
The sheet metal shall comply with the Standards:

- UNI EN 10143:2006 Thin sheets and strips of steel with continuous hot dip coating – Tolerances on size and shape
- UNI EN 10346:2015 Continuous hot-dip coated flat steel products for cold forming – Technical supply conditions

The thickness must not be less than 20/10 mm.
The galvanizing must be uniform over the entire surface, carried out with the SENDZIMIR process; The average quantity of zinc must not be less than 275 gr/sqm.
The sheet metal and profile must be free of material and processing defects, free of burns, blows and interruptions.
The sheet metal and profile must be able to withstand the profiling and bending operations without the detachment of the protective coating.
The welding of the galvanized sheet and profile will be carried out with a hot head welder, the filler material will be pure tin in bars. The surfaces to be welded must be revived with hydrochloric acid in which small quantities of zinc have been dissolved.

Stainless Steel Sheet
The sheet metal will comply with the reference standard, made with AISI 304 steel, 2B finish.
The thickness must not be less than 800 mm.
The sheet metal must be free from any defect in material and workmanship, without interruptions.
Welding may only be carried out in the workshop with the use of filler material with characteristics equal to or compatible with the material to be welded.

28.12. Surface treatments

6.14.1 Pre-painting

The following cycle must follow:

Pre-treatment: before painting, the sheet metal will be cleaned and degreased with bonderization in the bath; Both faces will undergo a phosphochromatization process in order to obtain an excellent base for the adhesion of the first layer of paint.
First layer: the first layer will be obtained by applying a coat of epoxy-phenolic resin-based paint on both sides with a thickness of about 5 microns per side and curing in an oven at about 350°C.
Second layer: the second layer will be obtained by the application of polyvinylidene fluoride (PVF); the application will take place on one side with a thickness of 20 microns and polymerization in an oven at about 320°C.

6.14.2 Artifacts

Touch-ups on site on pre-painted sheets are not allowed
The deteriorated sheets must be replaced with intact ones, by and at the expense of the Contractor himself, at the sole discretion of the Contracting Authority.
Downspouts and overflow drains
The downspouts and overflow drains must be made as indicated on the attached technical data sheets. Particular attention must be paid to the protection of the surfaces in contact with the masonry structures using the materials provided.
Expansion joints
The expansion joints must be made as indicated on the attached technical sheets.

28.13. Processing

All the works will be carried out in a workmanlike manner, in such a way as to guarantee complete waterproofing.
The project drawings must be respected, as well as the construction drawings provided by the Contractor and approved by the Works Management.
The work will be carried out in the workshop, as far as possible.
The work will be completed in every detail, carefully spliced and anchored adequately. The artifacts will be mounted plumb, level, in a square and in the necessary alignments and relationships with the other works.
It will be the responsibility of the Executor of the individual processes to verify that, following contact with metals of different nature and nobility, no galvanic phenomena are triggered with consequent degradation of some components. It will also be the responsibility of the Executor to provide, if necessary, for the use of separating elements in neoprene or other suitable dielectric material. These elements must not hinder the creation of the connections as provided for in this specification and the annexes connected to it.
The metal will be shaped without breaking either the metal or its coating. The curves and bends will be sharp and decisive. The metal shaped in curvature will correspond to the radii compatible with the thickness of the sheet metal and free of obbbies, twists and snaking.
The sheets must be rigidly secured to the support structures. These structures will have to be examined beforehand from the point of view of alignment. The work will not proceed until any alignment errors have been corrected.
The tinsmith works in adherence to the waterproof membranes will be installed at the time of laying the mantle itself so that the appropriate incorporation and overlapping works are allowed, without this being able to damage the mantles.

The distances between the expansion joints, the retaining profiles of the gravel, if any, the bands and elements in general, will be as long as possible in order to reduce the number of joints.
The flashings will be installed wherever it is necessary to ensure water tightness, even if not expressly indicated in every detail of the project. Flashings shall be installed at walls, elevations, and wherever the roofing membrane terminates against a vertical surface. The lower edge of the flashing will be bent so as to adhere tightly against the membrane of the cover, without damaging it.
After the installation is complete, the metal sheets will be cleaned of bitumen, dirt, stains, and paint. The damaged works will be repaired following the unquestionable directives of the Works Management.

28.14. Installation

The construction drawings, as well as the executive drawings provided by the Contractor, and approved by the Contracting Authority, must be respected.
The sheets must be rigidly secured to the support structures. These structures will have to be examined beforehand from the point of view of alignment.
The work will not proceed until any alignment errors have been corrected.
The work will be completed in every detail, carefully spliced and anchored as required by the calculation referred to in the next point.
The artifacts will be mounted plumb, level, in a square and in the necessary alignments and relationships with the other works. Materials that are not compatible with each other will be overcome with bituminous paint, by means of PVC sheathing or PVC adhesive tape.
Nails, rivets, screws, bolts, staples, washers, expansion inserts, fastening housings, flashings and other fasteners will be of the type and size most suitable for their use.
The tinsmith works in adherence to the waterproof membranes will be installed at the time of laying the mantle itself so that the appropriate incorporation and overlapping works are allowed, without this being able to damage the mantles.
The flashings will be installed wherever it is necessary to ensure water tightness, even if not expressly indicated in every detail of the project. Flashings shall be installed at walls, elevations, and wherever the roofing membrane terminates against a vertical surface. The lower edge of the flashing will be bent so as to adhere tightly against the membrane of the cover, without damaging it.
After the installation is completed, the metal sheets will be cleaned of bitumen, dirt, paint. The damaged works will be repaired following the unquestionable directives of the Contracting Authority.
Converse – colmi – compluvium – flashings
All the products referred to in this title and the like, unless otherwise prescribed, must be made of galvanized steel sheet of the type and minimum thickness indicated above. They will have adequate development (width in any case not less than 50 cm, except for flashings) and shapes as per the project or prescription.
The welding of the joints will be done with an overlap of about 5 cm, on both head wires, and reinforced with rivets 5-6 cm apart and staggered. The slope must not be less than 1%.
When laying long sections, the expansion must be taken into account; sections of about 20 m will then be laid, detaching the heads of about 3 cm and covering the upper edges with a joint cover.
The valleys placed along the vertical masonry walls must have free ends for the expansion of the metal and be equipped with drip trays, walled into the special recess prepared in the wall.

Hardware

Connections and fixings will be created in such a way that, due to temperature changes, the individual elements can expand, contract and move without obstacles, ensuring maximum and complete impermeability over time.

Nails, rivets, screws, bolts, staples, washers, expansion inserts, fastening housings, flashings and other fasteners will be of the type and size most suitable for their use.

Rivets and rivets, if made of copper, will be tinned.

Hardware, screws, or terminal blocks must be made of stainless steel.

Special types of fastening may be considered and applied if approved by the Works Management.

The fixings must be carried out in a workmanlike manner and without causing damage (including aesthetics) to the support structures.

The use of nails or staples fired for fixing the artifacts will be strictly excluded.

In particular, the following indications must be observed regarding the joints of the roofing sheets:

All connections and fixings, unless otherwise specified, will be made by crimping;

Brazing will be allowed only if carried out with total disintegration;

The width of the brazing seams shall not be less than 15 mm;

The fixing of the sheets with the use of screws will not be allowed;

The use of elastic mastics for joining the sheets will not be allowed;

Seals

They must be made of material such as to maintain their initial characteristics of elasticity over time and must be applied in such a way as to avoid infiltration of water, air and dust through the joints.

The type of gasket must in any case be approved by the Works Management.

Joints

Where there are no specific descriptions regarding the joints, the following indications must be observed.

Generally, however, the joints must be reduced to the bare minimum. For very long stretches, appropriate joints must be prepared to ensure, in addition to the seal, the possibility of free expansion.

Accessories and miscellaneous

Collars, storks, filler covers and other mounting accessories must be made of galvanized steel or stainless steel, sized and machined according to the prescriptions, and in any case in such a way as to ensure the maximum guarantee for the use for which they are intended.

Channels, gutters, flashings, etc., must be perfectly aligned. The joints must be made symmetrically.

Armrests, collars, storks and other visible supports must be distributed symmetrically.

Gutters: the gutters must be placed in place with the slopes necessary for perfect drainage of water. They must be supplied on site with the necessary joints and flaps to follow the eaves lines; they must also be complete with special pieces for opening, outlet, shelter, etc.

The number of storks must be such as to ensure the perfect and complete support of the canals.

Converse, valley, flashing, ridge, etc., must be made with dimensions and shapes such as to ensure complete suitability for the purpose for which they are intended. The fixing to the structures must be carried out in the most suitable ways and with the accessories most suitable to guarantee their immovability.

The unions must be installed at the same time as the waterproofing mantle. Before installation, the copper unions must be suitably protected from contact with conglomerates and mortars, with the application of bituminous paint given in an amount of not less than 1.5 kg per square meter.

28.15. Protection - Packaging - Transport

Pre-oxidized copper sheets must be treated with the utmost caution.
For this reason, the sheets will be supplied with the pre-oxidized sides in contact with each other; They will be scratch-free, dry and packed with special care.
The pallets will have a weight agreed with the Works Management to allow the handling of the construction site.
Each pallet will be entirely wrapped in sturdy opaque polyethylene and on each side it will bear labels with indelible writing clearly indicating the contents of the package and the sector of destination.
All accessories will be packed in wooden crates, which will bear indications of the contents on the outside as described above. The transport of pallets will be carried out using closed means of transport.

28.16. SH04, SH12, SH16 – Downpipe with circular section

Supply and installation of downpipes with circular section, complete with water collection box, model to be sampled, RAL 7046 color to be sampled for approval by the D.L.
For assembly and position, follow the project drawings.
On a project basis, we distinguish the following types of downspout:

- SH04: diameter 19cm;
- SH12: diameter 15cm;
- SH16: diameter 20cm

Including and compensating are the cutting of sheet metal according to design shapes, scrap, powder coating, the execution of corner fittings, hooking clamps, anchoring materials with anti-corrosion protection, the formation of an on-board drip tray, compliance with the CE and DOP marking for construction products provided for by Regulation no. 305/2011 (EU) and anything else to give the finished work in a workmanlike manner.

28.17. SH11 - Gutters in roof

Supply and installation of gutter channels in press-bent aluminium sheet, thickness 6/10mm, pre-painted with powder finish, RAL 7046 colour to be sampled for approval by D.L.
Development as per the design documents, to be positioned on the roof, per project we distinguish:

- SH11: size 19x17cm

Including and compensating are the cutting of sheet metal according to design shapes, scrap, powder coating, the execution of corner fittings, hooking clamps, anchoring materials with anti-corrosion protection, the formation of an on-board drip tray, compliance with the CE and DOP marking for construction products provided for by Regulation no. 305/2011 (EU) and anything else to give the finished work in a workmanlike manner.

29. WORKS BY PAINTER

29.1. Generality

It is the right of the WORKS MANAGEMENT to have chemical, physical and mechanical tests and analyses carried out, to verify the qualitative and quantitative composition of the materials, the thickness of the product applied, as well as the tests provided for in the UNICHIM 4715/61 standard, (paints, varnishes and enamels, properties and test methods).
The analyses and tests must be carried out by specialised laboratories.
The main tests and determinations that can be carried out are:
Adhesiveness and tensile strength
elongation or deformation over support
Gloss Degree
Hiding power
surrender
Dilability
hardness
Air drying
relative specific gravity
Grinding fineness
resistance to water, saline solutions and chemical agents
Weather resistance
Light Resistance
Temperature resistance
Resistance to temperature variations
sedimentation
Dynamic viscosity
kinematic viscosity.
The materials must comply with the technical data sheets and must be supplied in sealed containers and with an indication of the contents.

29.2. Method of execution

29.3. Surface Preparation

A) Concrete
Make sure that the jet has been running for at least 28 days.
Eliminate all concrete imperfections, bumps and voids caused by the inclusion of air and water in the casting.
In the event that strong irregularities are detected at the time of stripping the concrete, a layer of cement mortar (one part of sand and two of cement) must be applied to the newly reinstated concrete in order to ensure adherence. Allow the applied mortar to harden for at least three days, keeping its surface moist, then level it out.
Rough surfaces must be treated with a light sandblast or alternatively, with a thorough brushing.
Before starting painting operations, make sure that all dust has been removed and that the surfaces are completely dry.

B) Civil plaster, gypsum, plasterboard

Thorough cleaning of the surfaces to be painted, levelling of any irregularities with emulsified putty and subsequent sandpaper.
Any presence of oils and greases must be eliminated by washing the surface with solvent. In the case that the pre-existing paint is lime, hardening or glue, a careful scraping of the surfaces is necessary in order to remove the previous film.

C) Wood
Proceed with a light sanding and dusting.
If there are patches of resinous exudation, wash with alkaline solution (caustic soda) and rinse with water.
On already painted wood, sand with sandpaper to even out the surfaces. In the case of a nitro bath, the paint must be completely removed, restoring the surface of the wood.

D) Steel surfaces
For the criteria for surface preparation, treatment and final checks, please refer to specification (04) CM_01 – Metal carpentry.

E) Aluminium surfaces
Surfaces exposed to air
Removal of fatty substances, salts, etc., by cleaning with solvents, vapours, alkalis, emulsions (SP1 - AL standard).
Submerged surfaces
Removal of fatty substances, salts, etc., creating a rough surface using silica abrasives (SP7 - AL standard).

F) Heterogeneous materials
For the painting of heterogeneous materials, such as plastics, reinforced glass fibres, expanded polymers, etc., the suitable solution for the purpose must be studied. Therefore, the surface preparation standards are not given, nor is the description of the materials to be used.

29.4. Storage of paints and thinners

All paints and thinners should be stored in well-ventilated areas, away from flames and sparks and protected from direct sunlight and excessive heat.
The manufacturer's labels and labels must be kept intact on the containers of paints and thinners.
Paint and thinners containers should not be opened until ready for use.

29.5. Application of paints

A) General criteria
The method must lead to a uniform application of the paint, so that it is satisfactory from a technical and aesthetic point of view.
Before starting the painting, notice must be given to the WORKS MANAGEMENT to agree on the dates of the inspections.
Paintings that are coagulated, gelatinous or in any way deteriorated when opening the containers must be discarded.

If a thin skin has formed on the surface, the paint can be used after removing the skin.
The mixing of one-component products with the diluent, and of the two-component products with the hardener and its thinner, must take place in the ratios indicated by the supplier.
Two-component paints with a limited pot-life shall be used within the time interval specified by the paint manufacturer.
The application of the paints can be done by brush, spray, with or without air, with a combination of these methods according to the instructions of the manufacturer of the paints.
The application of the paints must be done by expert operators; the thickness of the various coats of paint must be uniform and the painted surface must be free from brush marks, drips, discontinuities and other defects.
Particular care must be taken to keep all the works already carried out unpainted such as: windows, false ceilings, floors, systems, etc.
Any paints that may have been deposited on these parts must be removed.
During the application of the paints, particular attention must be paid to the edges, shutters and areas that are difficult to access.
The first coat of paint should be applied within 24 hours after the preparation of the surfaces. If the surface has been sandblasted, it will be preferable to apply the paint within 6 hours.
The application of the first coat must in any case be carried out before the prescribed standard of cleanliness is altered.

B) Weather conditions
The paints should not be applied when it rains, snows, in the presence of fog or excessive dust.
The paints should not be applied in atmospheric conditions that favor condensation rather than evaporation of moisture from the surfaces to be painted. Traces of moisture must evaporate from the surface within 5 minutes.
Painting must not be carried out if the relative humidity of the air is greater than 85%.
When the temperature is below 5°C and above 45°C, the application of the paints must be approved by the manufacturer of the paints.

C) Application of coats subsequent to the first
Before applying each successive coat of paint, the previous coat must be completely dried or hardened.
Before applying each subsequent coat of paint, any damage to the coats already applied must be repaired, using the same type of paint used previously.
The colour of each coat of paint should be different from that of the previous coat to avoid leaving unpainted areas and to facilitate inspection.

D) Thickness of paints
Thickness measurement
The measurement is used to check the thickness of the protective film and the uniformity of the application in its extension.
Wet film and dry film thickness control will be performed.
The numerical ratio between wet and dry thickness must be indicated by the CONTRACTOR with the sampling.

For the determination of the thicknesses of paints on steel substrates carried out with magnetic instruments, the methods to be followed are collected in the SSPC - PA2 + 73T standards.
In no area should the thickness be less than required.
In the event that the minimum prescribed thickness is not reached in any area, an additional coat of paint must be applied in these areas.
The thickness of the paints must not exceed the minimum prescribed thickness by such an amount as to impair the appearance or behaviour of the paints.

29.6. Reference legislation

- UNI 8752:1985 Construction. Painting, painting, RPAC, painting, surface impregnation. Classification, terminology and functional layers.
- UNI 8753:1985 Construction. Painting, painting, RPAC, painting, surface impregnation. Requirements analysis
- UNI 8754:1985 Construction. Painting, painting, RPAC, painting, surface impregnation. Features and Test Methods
- UNI EN ISO 3668:2020 Paints and varnishes – Visual comparison of paint color
- UNI 8681:1984 Building. Products for varnish system, paint system, texture and rendering finishes and glaze and stain system. General criteria of classification
- UNI 10369:2010 Products for painting – Determination of the resistance of the films of painting products to the alkalinity of the mortar
- ISO 8130-1:2019 Coating powders – Part 1: Determination of particle size distribution by sieving
- UNI ISO 3905:1990 Paint products. Determination of the contrast ratio (hiding power) of light paints at a given surface yield using black-white contrast papers
- UNI EN 13300:2002 Paints and varnishes - Water-based coating products and systems for interior walls and ceilings – Classification

29.7. Acceptance Requirements, Sampling/Testing Methods, Tests and Warranties

29.8. Surface control

Before starting the painting, the WORKS MANAGEMENT will check that the preparation operations have been carried out according to the SSPC standards, and that the visual standard corresponds to the photographic standard of the Swedish standards of the Svenks Standard SIS.

29.9. Checking painted surfaces

The painted surfaces will be visually inspected to check the appearance and continuity of the paints. Areas where the presence of porosity or discontinuity of the paints is suspected should be checked with tools such as the Spark Tester or other suitable tools.
The wet thickness of the paints can be checked with comb thickness gauges or other suitable tools.
The dry thickness of the paints should be checked with instruments such as the Microtest or Elcometer or other suitable tools.

5 measurements (each resulting from the average of 3 readings) must be performed at five points spaced regularly for each area area or less.
The average of the 5 sizes must not be less than the required thickness. No single measurement must be less than 80% of the required thickness.

29.10. Certificates, approvals

The CONTRACTOR must produce the approval certificate of the products it intends to use.

29.11. Cleaning and protection of the work

At the end of each individual job, you will have to proceed with a thorough cleaning of the rooms. The works must be protected from accidental impacts and physical-chemical aggressions.

29.12. Tests

The tests of the samples and the comparison with the samples provided to the WORKS MANAGEMENT must be delivered on a case-by-case basis.
The tests must be carried out in the positions and buildings, or portions thereof, indicated by the WORKS MANAGEMENT.

29.13. Guarantees

The duration of the warranty is not intended as a real protective limit of the coating applied, but as the period of time within which the guarantor or guarantors are required to intervene to carry out those restorations that may be necessary for reasons dependent on them.
The warranty concerns only the protection, (meaning corrosion the alteration of the metal or cementitious support) does not include the normal degradation of the aesthetic characteristics of the film (color point, gloss, etc.).
The warranty conditions are expressed in the following parts:
product quality assurance;
quality assurance of the application;
Guaranteed durability of the coating.

A) Product quality assurance
The Manufacturer warrants the following:
the paints are suitable for the uses for which they are proposed;
comply with the technical data sheets and samples provided;
are free from manufacturing defects.

B) Application Quality Assurance
The CONTRACTOR APPLYING guarantees the following:
proper preparation of the substrate;
perfect application in a workmanlike manner and in scrupulous compliance with the instructions provided by the Manufacturer;
that the products have been applied in the prescribed thermo-hygrometric and environmental conditions of the substrate.

C) Guarantee durability of the coating
On the basis of what is specified in the previous paragraphs, the Manufacturer of the paints and the CONTRACTOR APPLYING COMPANY agree to jointly sign a commitment to guarantee the durability of the coating defined by the contract.
The commitment includes the free execution of all repairs to the coating in the event of degradation of the same, caused by deficiency and non-compliance with the quality and application commitments defined in the previous paragraphs.
The warranty period starts from the date of acceptance of the work by the
CUSTOMER (or of each lot if the work is not continuous).
The protective coating will be judged to be satisfactory in duration if the following occurs at the end of the fixed period:
The effectiveness of the coatings according to the contractual purpose for which they were applied on their entirety remains unaltered, they do not show traces of degradation exceeding those of the reference of the contract;
On ferrous materials there is no rust between the substrate and the paint film, whether perforating or visible through the coating without compromising its continuity.
During the warranty period, the guarantors must carry out one or more general inspections of the entire work, and make any adjustments deemed necessary. This also following a report by the CUSTOMER.
The guarantee commitment is considered forfeited if the ORDERING PARTY carries out other treatments applied without the written approval of the guarantors.

29.14. Painting and varnishing for interiors and exteriors

29.15. Reference standards

- UNI 8681:1984 Building. Products for varnish system, paint system, texture and rendering finishes and glaze and stain system. General criteria of classification
- UNI 8752:1985 Construction. Painting, painting, RPAC, painting, surface impregnation. Classification, terminology and functional layers.
- UNI 8753:1985 Construction. Painting, painting, RPAC, painting, surface impregnation. Requirements analysis
- UNI 8754:1985 Construction. Painting, painting, RPAC, painting, surface impregnation. Features and Test Methods
- UNI 10560:1996 Paint products Emulsion wall paints for interiors. Resistance to washing. Brush method.
- UNI 10792:1999 Paints and varnishes - Emulsion paints for interiors, white or lightly coloured - Determination of dirt setting
- UNI EN 13300:2002 Paints and varnishes - Water-based coating products and systems for interior walls and ceilings – Classification
- UNI EN 1062-1:2005 Paints and varnishes - Painting products and systems for external masonry and concrete - Part 1: Classification

- UNI EN 1062-3:2008 Paints and varnishes - Painting products and systems for external masonry and concrete works – Part 3: Determination of permeability to liquid water
- UNI EN 1062-6:2003 Paints and varnishes - Products and coating cycles of external masonry and concrete works - Determination of carbon dioxide permeability
- UNI EN 1062-11:2003 Paints and varnishes - Coating materials and coating systems for exterior masonry and concrete - Methods of conditioning before testing
- UNI EN 927-2:2014 Paints and varnishes - Wood coating products and systems for outdoor uses - Part 2: Performance specification
- UNI EN 927-3:2019 Paints and varnishes - Products and coating systems for wood for outdoor uses – Part 3: Natural aging test
- UNI EN 927-10:2019 Paints and varnishes - Wood coating products and systems for outdoor uses – Part 10: Resistance to blocking of paints and varnishes applied to wood
- UNI EN ISO 3251:2019 Paints, varnishes and plastics – Determination of the content of volatile substances
- UNI 9796:2014 Reaction to fire of fire-retardant paint products applied to wood-based materials - Test method for classification purposes
- UNI EN ISO 12944-1:2018 Paints and varnishes - Corrosion protection of steel structures by painting – Part 1: General introduction
- UNI EN ISO 1514:2016 Paints and varnishes – Standardized panel for control tests
- UNI EN ISO 15528:2020 Paints, varnishes and raw materials for paints and varnishes - Sampling
- UNI EN ISO 2808:2019 Paints and varnishes - Determination of film thickness
- UNI EN ISO 4618:2016 Paints and varnishes - Terms and definitions

29.16. Material characteristics

29.17. Paints and varnishes

The materials used in the works of the painter must always be of the best quality.

- Lime milk. The lime milk will be prepared with fat lime, perfectly white, extinguished by immersion. You can add the amount of carbon black strictly necessary to avoid the yellowish tint.
- Water, glue or oil paints. The earth-colouring agents intended for water-based, glue-coloured or oil-coloured dyes shall be finely ground and free of heterogeneous substances and shall be perfectly incorporated into water, glues and oils, but not by infusion. They can be requested in any existing shade. The use of gums produced by distillation is excluded. Any special paints prescribed by the Works Management must be supplied in their original closed containers.

- Encaustics. The encaustics can be water-based or essence-based, according to the provisions of the WORKS MANAGEMENT. The yellow wax must be perfectly dissolved, depending on the encaustic used, either in hot water to which tartar salt will be added, or in the essence of turpentine.

29.18. Eco-friendly wall paint

Supply and installation of wall paint for interiors based on selected and eco-friendly raw materials in water dispersion, single-component, physically drying, opaque, acrylic.
Colors obtained from natural earths with the following main characteristics:
- "Zero VOC" - Absence of glycols - Does not alter the natural transpiration of the wall
- High coverage – Washable Classification (UNI 8681:1984) B4. C.O.A.2.FA
To be applied as a normal two-coat water-based paint on a clean and dry surface after a fixative base coat

Features and more Technical information	Method	Main data at 20°C and 60% Relative Humidity.
Appearance and finish		Very opaque
Density g/ml	MPL 007 (UNI 8910)	1,480 - 1,540
Viscosity Brookfield cps	MPL 021 (ASTM D 2196)	9000 - 15000
Recommended dry thickness Microns per hand	MPL 056 (ASTM D 1186)	40 - 60
Flash Point°C	MPL 046 (UNI 8909)	Non-flammable
Solids content % by weight	MPL 027 (UNI 8906)	61 - 63
Storage Life (in a cool, dry place)	MPL 064 (UNI 10154)	At least 36 months
Volatile organic compound content (VOC) g/L	MPL 109(ISO 11890-2)	< 10 g/l
Dry to the touch h	MPL 033	Max 0.5
Deep dry h	MPL 033	Max 12
Overcoatability h	MPL 037	4 - 6
Exterior \ Interior		YES \ YES
Colors	White, Tints	of folder
Binder		Vinyl acrylic
Diluent		Water
Roller application % by volume	MPL 063	30 - 40 %
Brush application % by volume	MPL 063	30 - 40 %
Spray and air application % by volume	MPL 063	30 - 40 %

29.19. Insulator

Depending on the support (slightly or very chalking) for the insulation and anchoring of the paint, the CONTRACTOR, as an alternative to the first coat, may apply a fixative/insulator based on acrylic resins in water dispersion, suitable for receiving all the products for water-based paintings.
Physical-technical characteristics:

- color	Transparent colorless
- Dry film appearance	opaque
- application	brush, roller, airless
- viscosity	thixotropic
- dilution	water
- Drying time:	
. dry to the touch	2-3 hours
. deep	12-24 hours
- Over-paintability: minimal	3-4 hours
- Minimum and maximum application temperature	+2°C - + 40°C
- Practical consumption	150 gr/sqm

29.20. Potassium silicate paint

Product based on potassium silicate and selected pigments that are stable to light and alkalis

Average specific gravity: 1.5 Kg/l
Viscosity: 8000/10000 cps
Time between coats: 24 hours in optimal environmental conditions.
Application temperature: 8 - 30 °C. Do not apply on surfaces with direct sun and in the presence of wind
The application of the product carried out in unsuitable weather conditions negatively affects the drying times, compromising the optimal achievement of aesthetic and performance characteristics.
In particular, the application performed at high temperatures (>30°C), negatively influences the silication process. The consequent presence of active silicate can give rise, following washouts by rainwater, to the formation of unsightly stains or insoluble whitish drips of silicate, for the resolution of which it is necessary, before proceeding with the reapplication of the cycle, a neutralization intervention

- Yield: 6 sqm/l in both coats. The yield may vary according to the absorption and irregularity of the substrates
- Paint appearance: Matte. The chromatic aspect is influenced by the chemical-physical characteristics of the substrates involved and by the environmental conditions that accompany the application and drying phases
- Weather resistance: Excellent
- Water vapour diffusion resistance factor: 97.9 u
- Equivalent Air Layer (SD): 0.0186 m

- Water vapour transmission rate: 705.6 g/sqm in 24 h (ASTM E 96)

How to use

- Application: Brush and mottler
- Dilution: With Sikkens bottom
- I hand 100% by volume
- II hand 15% by volume
-

29.21. Dustproof treatment

Product for dust-proof treatment of both plastered and reinforced concrete interior surfaces. Two-component paint based on acrylic polyurethane resins on dry and well-seasoned reinforced concrete or cementitious plaster.

Product specifications:

color	by project
Dry film appearance	Gloss Gloss
application	brush, roller, airless spray
Number of members	2
Mixture Ratios by Weight	81-19
viscosity A+B =150"-200"	CF4 at 25°C
Pot-life	5-6 hours
Drying time:	
dry to the touch	2-3 hours
deep	24 hours
Overpaintability:	
minimum	2-24 hours
maximum	72-96 hours

minimum and maximum application temperature +5°C - +4°C

Practical reference consumption at 80 microns dry thickness 200 gr/m²

29.22. Application of acrylic impregnating primer in water dispersion

Application of acrylic resin-based impregnating agent in water dispersion, solvent-free, to reduce and uniform the absorption of plaster, gypsum, plasterboard, grout and skim coats of internal and external wall supports.

Applied by brush, on perfectly dry, seasoned substrates with no parts in the detachment phase. The price includes and compensates for the formation of provisional works for the execution of the works in safety, and subsequent disassembly, the preparation of the surface with cleaning, occasional grouting, the charges for the protection of the floor with nylon sheets, the masking with wrapping paper and adhesive tape of windows in general, cleaning, the separate collection of the resulting material, the transfer with transport to an authorized landfill of the resulting material, the landfill indemnity, compliance with the CE marking and the PDO Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

29.23. Protective coating based on epoxy resins

Thick protective coating based on epoxy resins and aliphatic amine hardeners.
It is applied to carefully cleaned and dry in-situ and precast concrete surfaces.
Two-component product with high chemical and mechanical resistance that can be applied starting from
+5°C with operating temperature from –20°C to +90°C.
Specifications:

color	clear to sample
application	brush, roller, airless
components	2
own weight	1.46 ± 0.02 g/cm3
Mixture ratio	100 parts by weight of basic 26 even by weight of hardener
Viscosity 20°C	13,000 ± 1,000 mPa.s
20°C useful way	60 minutes
Theoretical consumption	460 g/m² per coat
thickness	300 microns
dry residue	96% by weight, 93% by volume
hardening 22°C, 60% RH:	
dry to the touch	6 hours
Overapplication	6 hours minimum, 24 hours maximum
Completed hardened	10 days
Flash point	< 21°C

29.24. Criteria for the execution of the works

Any painting, colouring or varnishing must be preceded by a suitable and very accurate preparation of the surfaces, and precisely by scraping, peeling, any recovering of edges and everything necessary to equalize the surfaces themselves.
Subsequently, the aforementioned surfaces must be perfectly smoothed with sandpaper and, when it comes to colouring or painting, again grouted, then pumice and smoothed, after priming, with methods and systems designed to ensure the perfect success of the work.
Special attention must be paid to the surfaces to be covered with paints.
The paintings, colourings and varnishes must, if required, also be carried out with different colours on the same wall, complete with threads, plinths and anything else necessary for the execution of the work in a workmanlike manner.
The choice of colors is due to the unquestionable criterion of the Works Management and no distinction between ordinary colors and fine colors will be allowed, since in any case the finest materials and the best quality must be provided.
In the event of a dispute, if the CONTRACTOR is unable to demonstrate the number of passes made, the decision will be against the CONTRACTOR itself. In any case, it is obliged, after the application of each pass and before proceeding with the execution of the next one, to obtain a written declaration from the staff of the Works Management.
Before starting the works as a painter, the CONTRACTOR is also obliged to carry out samples of the various finishing works in the places and in the manner that will be prescribed to it, both for the choice of colours and for the type of execution, and to repeat them if necessary with the required

variations, until the approval of the Works Management is obtained. Finally, it must take every precaution and means to avoid splashes or stains of paints or varnishes on the finished works (floors, coatings, fixtures, etc.), remaining at its expense any work necessary to repair any damage caused.
Special designs
The works must normally be carried out by suitably combining the elementary operations and the particular indications that follow.
The Works Management will have the right to vary, at its sole discretion, the elementary works listed below, deleting some or adding others that it deems more particularly suitable for the specific case and the CONTRACTOR COMPANY must comply with these requirements without therefore being able to raise exceptions of any kind.
Common enamel paintings. - They will be carried out with appropriate preparations, depending on the degree of finishing that the Works Management wants to achieve and depending on the material to be covered (plasters, woodwork, iron, etc.).

Once the surface is properly prepared, the following operations will be carried out:
- application of a coat of enamel varnish with a slight addition of turpentine;
- light cloth pumice;
- application of a second coat of enamel paint with the exclusion of thinner.

Painting with petrifying and washable titanium white paints (such as "Cementite" or similar), on plasters:

A) Type with smooth finished surface or "orange peel":
- dusting, cleaning and sanding of surfaces with sandpaper;
- plaster and glue grouting;
- coat of light glue fixative solution in water;
- application of a layer of standolio with a slight addition of white lead, all diluted with white spirit;
- brush application of two layers of titanium white-based paint diluted with turpentine and with the addition of cooked linseed oil in a small percentage; the second layer will be beaten with a brush to obtain the orange peel surface.

"Wrought" type with relief surface. - The operations listed above by nos. 1 to 3 for type E), in:
- application by brush of a layer of paint as above to which will be added Meudon powder white in the percentage necessary to obtain the desired degree of relief;
- beating at short intervals after application 4), carried out with a special brush, rubber rollers, etc.

29.25. Preparation of the substrate with water-based acrylic insulation for painting light colours

Application on all newly supplied plasterboard walls of acrylic impregnating agent in solvent-free water dispersion, colourless, for wall supports, suitably diluted according to the application system adopted.
Based on synthetic resin in water dispersion, it reduces and uniforms the absorption of plaster, gypsum, plasterboard, grouts and skim coats, dust-free and unsaponifiable.
SPECIFICATIONS:
- Viscosity: Water-type solution
- Density (density): 1.03 ± 0.05 kg/dm3
- pH 8 – 9
- Solid content: 27 ± 2% by volume; 30 ± 2% by weight
- Drying at 23°C / 65% RH: Dry to the touch: 1 - 2 hours
- Overapplication: After 3 – 4 hours
- Coloring: Colorless transparent

The impregnating agent will be applied by brush on suitably prepared, compact and stable substrates, free of parts in the detachment phase, from any type of residual moisture or infiltration.
All newly built surfaces, both vertical and horizontal, are intended to be impregnated, and the existing surfaces, both vertical and horizontal, are restored, which will then be painted with washable water-based wall paint.
The price includes and compensates for the formation of provisional works for the execution of the works in safety, and subsequent disassembly, the preparation of the surface with cleaning, occasional grouting, priming, primer, including touch-ups at the end of the work, the costs for the protection of the floor with nylon sheets, masking with wrapping paper and paper adhesive tape, of windows and doors in general, cleaning, separate collection of waste material, transfer of waste material with transport to authorized landfill, landfill indemnity, compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

29.26. Preparation of the substrate with water-based acrylic insulation for dark colour painting

Application on all newly supplied plasterboard walls of pigmented acrylic insulation based on styrene-acrylic resin emulsified with E.B.S. technology and inorganic pigments in the colour corresponding to the finish, suitably diluted according to the application system adopted.
Main properties: opaque appearance, excellent dilution and coverage, isolates and evens out the absorption of substrates, unsaponifiable, promotes uniformity of color and coatings of paints.
SPECIFICATIONS:
- Viscosity: Brookfield 2000-2800 cps at 23°C
- Density (density): 1.20 ± 0.15 kg/dm3
- Drying at 23°C / 65% RH: Dry to the touch: 1 - 2 hours
- Overapplication: After 12 hours with other types of product; after 6 hours between two coats of Alpha BL Grond
- Colouring: only with Akzo Nobel's Acomix tinting system using W05, N00 1 bases; 2.5 and 10L

The impregnating agent will be applied by brush on suitably prepared, compact and stable substrates, free of parts in the detachment phase, from any type of residual moisture or infiltration.
All newly built surfaces, both vertical and horizontal, are intended to be impregnated, and the existing surfaces, both vertical and horizontal, are to be restored, which will then be painted with washable dark-coloured wall water-based paint.
The price includes and compensates for the formation of provisional works for the execution of the works in safety, and subsequent disassembly, the preparation of the surface with cleaning, occasional grouting, priming, primer, including touch-ups at the end of the work, the costs for the protection of the floor with nylon sheets, masking with wrapping paper and paper adhesive tape, of windows and doors in general, cleaning, separate collection of waste material, transfer of waste material with transport to authorized landfill, landfill indemnity, compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

29.27. Painting for metals

29.28. Reference legislation

- UNI 10527:1997 Paint products. Preparation of steel supports before the application of paints and similar products - Tests to evaluate the cleanliness of the surfaces. Field test for soluble iron corrosion products
- UNI EN ISO 12944-1:2018 Paints and varnishes - Corrosion protection of steel structures by painting – Part 1: General introduction
- UNI EN ISO 12944-2:2018 Paints and varnishes - Corrosion protection of steel structures by painting – Part 2: Classification of environments
- UNI EN ISO 12944-3:2018 Paints and varnishes - Corrosion protection of steel structures by painting – Part 3: Design considerations
- UNI EN ISO 12944-4:2018 Paints and varnishes - Corrosion protection of steel structures by painting – Part 4: Surface types and their preparation
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- UNI EN ISO 12944-6:2018 Paints and varnishes - Corrosion protection of steel structures by protective paint systems - Part 6: Laboratory performance test methods

29.29. Material characteristics

- White spirit (turpentine essence) - It must be clear, colorless, with a pleasant smell and very volatile. Its density at 15°C will be 0.87.
- White lead - White lead or cerussa (basic lead carbonate) must be pure, without mixtures of any kind and free of any trace of barium sulphate.

- Zinc white. - Zinc white must be in a very fine, white powder, consisting of zinc oxide and must not contain more than 4% of lead salts in the sulphate state, nor more than 1% of other impurities; humidity must not exceed 3%.
- Minium - Both lead (lead sesquioxide) and aluminium (aluminium oxide) must consist of very fine powder and must not contain aniline-derived colours, nor more than 10% of foreign substances (barium sulphate, etc.).

29.30. Anti-corrosion paint for metals

One-component anti-rust paint based on alkyd resins, short oil and zinc phosphate.
The chosen product must have characteristics suitable for forming a support for subsequent treatment with intumescent paint without the need for additional adhesions.
It is applied to thoroughly cleaned and dry steel.
Features:

own weight	1500 g/l
dry residue by weight	69%
dry residue by volume	50%
Drying at 20°	about 2 hours
resumption	after 60 min

The amount of application is 120 g/m², by spray (in one coat) or by brush (in two coats).

29.31. Painting with ferromicaceous enamel

Drying enamel by oxidation, which combines the protective effect with a particular decorative effect with a metallic appearance, with shades from medium dark gray and with colored nuances towards green, blue and red, identifiable from the relative color chart.

Features
The "Chreon ferromicaceous isometal" or equivalent nail polish has a very high viscosity (thixotropic), preferably to be applied with a soft brush, but it is also well suited to roller and spray application.
The metallic effect of the surface has a very matte and rough appearance.

Media Preparation
Isometal ferromicaceous must be applied directly to iron substrates, not exposed to atmospheric agents, sanded, degreased and free of corrosion.
For ferrous substrates exposed to the outdoors, at least one coat of synthetic anti-rust paint must be applied.
Metals protected with galvanization must use a primer-type primer coat.

Application methods and yield and drying characteristics
Application system: Applicable by brush, roller or spray.

Mixing ratios	by weight	in volume

for brush and roller application		
Isometal ferromicaceous	100	100
Synthetic brush dil.	4±1	8±1
for spray application**		
Isometal ferromicaceous	100	100
Dil. Synthetic Spray	10±1	15±1
dry product residue		
Ready-to-use in %		
Brush or roller	75	46
spray	65	36
rendered theor. Prod. Ready to use	m2 / Kg	m2 / l
at dry film thickness of 60µm		
brush or roller	3,5	7
spray	4	5
method	**Units of measurement**	**values**
Viscosity of use		
brush and roller	Ford Cup 8 at 20 °C sec.	12±1 PM
spray	Ford Cup 4 at 20 °C sec.	40±1
Conditions of use	Temperature	°C 0 – 35
Environmental**	Relative Humidity R.H. %	40 – 90
drying at 20 °C	R.H.	60%
often. Dry film: 30µm	Manageable Hours	4- 5
(about a hand)	Full hours	24

Overapplication
After 24 hours from application, it can be overpainted with itself or other desiccant enamels by oxidation.
Cannot be overpainted with two-component nitro or polyurethane enamels

Sheet
Characteristics of dried film

method	**Units of measurement**	**values**

color	visual	Color chart
Mirror reflection*	UNI EN ISO 2813 Gloss	< 2
Resistance to agents		
Atmospheric w.o.m.		
(Accelerated test)	ASTM G 26 hours	1000***
Weather resistance	Relative Humidity R.H. %	40 – 90
(natural exposure)	LECHLER years	1***
often. Dry film: 30µm	Manageable Hours	4- 5
(about a hand)	Full hours	24

NOTES: * – Tests carried out by applying ferromicaceous ISOMETAL on sanded and degreased sheet metal at a dry film thickness of about 60 µm for 24 hours at 20°C.
*** – The natural exposure test was carried out in the LECHLER exhibition station, exposing the laminations to the outside, inclined at 45° and facing south. The results, both of natural and accelerated exposure, are similar; There are no structural alterations in the film.

Physical product data

method	**Units of measurement**	**values**
color	visual	Color chart
Density	(specific gravity) ISO 2811 '74 gr./millilitre	1,750±0,001
viscosity	ASTM D 2196 '86 Brookfield	
	gir. 5 speed. 5 Cps	1st) 9440±10
	gir. 6 speed. 50 Cps	2nd) 3170±10
	Rapp. by Tix. 1°/2°	3
Flash point	ASTM D 3278 °C	between 21 and 55_
Grinding (fineness)	mu 444 microns	60 ± 1
dry residue by weight	mu 591 %	78 ± 1
Dry residue by volume ISO 3233/84	%	50 ± 1
Stability in stock *	Months	12 Unchanged

NOTES:
* – Shelf stability means the product in the original and intact cans, kept at a temperature not exceeding 35 °C.

29.32. Painting with intumescent paints of metal structures

After the preparation of the surfaces by sandblasting and after the application of galvanizer, the steel surfaces must be treated with intumescent fire-resistant paint.
Before starting the operations, the CONTRACTOR will deliver the technical data sheets of the product with the description of the methods of installation, storage, preparation and control of the products. All products must be regularly certified by the Manufacturer in relation to the required protection class.
Resistance class R = 60
Dry Film Appearance: satiny
application: preferably by spray
viscosity: 150-300 P
own weight: 1.31 ± 2% gr/cc
Diluent: solvent for synthetic paints
Drying time:
dry 2 hours
deep 24 hours
Minimum practical consumption referred to 750 microns of dry film thickness
(Class 60) 1.5 kg/m²
Shelf life: 6 months in the original sealed containers
Application temperature > 5°C < 50°C

29.33. Criteria for the execution of the works

Any painting, colouring or varnishing must be preceded by a suitable and very accurate preparation of the surfaces, and precisely by scraping, peeling, any recovering of edges and everything necessary to equalize the surfaces themselves.
Subsequently, the aforementioned surfaces must be perfectly smoothed with sandpaper and, when it comes to colouring or painting, again grouted, then pumice and smoothed, after priming, with methods and systems designed to ensure the perfect success of the work.
Special attention must be paid to the surfaces to be covered with paints.
The choice of colors is due to the unquestionable criterion of the Works Management and no distinction between ordinary colors and fine colors will be allowed, since in any case the finest materials and the best quality must be provided.
The subsequent coats of oil paints and varnishes must be of different shades, so that it is possible, at any time, to check the number of coats that have been applied.
In the event of a dispute, if the CONTRACTOR is unable to demonstrate the number of passes made, the decision will be against the CONTRACTOR itself. In any case, it is obliged, after the application of each pass and before proceeding with the execution of the next one, to obtain a written declaration from the staff of the Works Management.
Before starting the works as a painter, the CONTRACTOR is also obliged to carry out samples of the various finishing works in the places and in the manner that will be prescribed to it, both for the choice of colours and for the type of execution, and to repeat them if necessary with the required variations, until the approval of the Works Management is obtained. Finally, it must take every

precaution and means to avoid splashes or stains of paints or varnishes on the finished works (floors, coatings, fixtures, etc.), remaining at its expense any work necessary to repair any damage caused. For metal works, the preparation of the surfaces must be preceded by scraping off the oxidized parts. Application of ferromicaceous enamel based on phenolic resin and wood oil pigmented with fine-grained micaceous iron, matte finish with a metallic appearance and excellent resistance applied in two coats, by brush.

29.34. VF03, VF05 - Surface painting with washable matt water-based wall paint for interiors

Application of two or more coats, on all the walls and false ceilings indicated in the project drawings, suitably diluted according to the application system adopted of water-based wall paint with an opaque appearance white RAL 9016 to be sampled for approval by the D.L., stain-free without damaging the finish, solvent-free for interior walls, with "Shield" technology to protect stains on painted interior walls, repellent does not allow water-soluble liquid substances to penetrate and ruin the finish, such as Sikkens Alpha Rezisto Mat, or similar approved by D.L.
Specifications:
- Viscosity: Brookfield 18000/22000 cps
- Density (density): 1.43±0.05 kg/mc
- Ph: 7/9
- Drying at 23°C / 65% RH: dry to the touch 1-2 hours
- Overapplication: after 3.4 hours
- Hiding power: Class 1
- Wet abrasion: Class 1

Environmental conditions for application: Temperature: 5 - 30°C; Relative humidity: max 85%.
The application of the product carried out in unsuitable environmental conditions negatively influences the drying times , compromising the optimal achievement of the aesthetic and performance characteristics.
Methods and tools: profiling brush, roller and airless spray.
Airless Application: Nozzle 0.46 – 0.53 mm (0.018 – 0.021 inch). Pressure: 160 – 180 bar.
In order to obtain more uniform finishes, particularly when applying intense and/or bright colors, after distributing the paint evenly, orient the rolls by blending upwards.
Warnings: ALPHA REZISTO MAT must be applied on perfectly dry, seasoned and compact substrates. If applied in white or light colours on contrasting coloured surfaces, or for particularly bright colours, to obtain total coverage, the ALPHA BL GROND opaque primer must be applied beforehand in the colour corresponding to the colour of the finish, diluted to a maximum of 30% by volume with water. To clean painted surfaces, we recommend the use of soft sponges and water mixed with POLYFILLA PRO S600 detergent in the ratio of 5 L of water 35 ml of detergent or with neutral detergents. Avoid the use of abrasive rags or cloths and detergents containing alcohol or solvents of any kind.
If the product is applied in environments with a high level of humidity, persistent over time, it does not guarantee its cleanability performance.
Operations such as sanding, sandblasting, flame removal, etc., of old layers of paints, can generate hazardous dust and/or fumes. Work in well-ventilated rooms and wear appropriate personal

protective equipment. For more information on the correct disposal, storage and handling of the product, please consult the relevant Safety Data Sheet
Finish: Apply two coats of Alpha Rezisto Mat with an interval of at least 3-4 hours between coats.

The price includes and compensates for the formation of provisional works for the execution of the works in safety, and subsequent disassembly, the preparation of the surface with cleaning, occasional grouting, priming, primer, including touch-ups at the end of the work, the costs for the protection of the floor with nylon sheets, masking with wrapping paper and paper adhesive tape, of windows and doors in general, cleaning, separate collection of waste material, transfer of waste material with transport to authorized landfill, landfill indemnity, compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

29.35. VF04 - Wall painting with matt water-based enamel – HUMID ENVIRONMENTS

Painting of the walls twice or more and as indicated in the project drawings, carried out with water-based acrylic enamel, opaque, white RAL 9016 to be sampled, such as Sikkens Alpha Unidecor BL Mat or similar approved by D.L., based on acrylic resins and very fine pigments, for fine finishes, highly resistant to wear and easy to clean.
The coating has good coverage and expansion, excellent adhesion, unsaponifiable; good expansion, excellent mechanical resistance and resistance to wet abrasion.
Particularly suitable for those interior surfaces where water-based finishes are required that can withstand cleaning with non-alcoholic sanitizing detergents.
Applied, after a water-pigmented primer based on emulsion resins and selected pigments, with excellent insulating and consolidating properties on interior wall surfaces, such as Sikkens AIpha BL Grond, with a short-haired roller and brush (only for profiling or painting small surfaces) on suitably prepared, compact and stable substrates, free of parts in the detachment phase, from any type of residual moisture or infiltration; carefully assessing the state of adhesion of the existing paint, removing the parts that are not perfectly anchored with paint removers or mechanical means deemed most suitable and following the instructions of the supplier.
For application on false ceilings, it is advisable to apply a water-based pigmented primer based on styrene-acrylic resins emulsified with E.B.S. (Emulsified Binding System) technology, and selected inorganic pigments, with excellent insulating and consolidating properties on interior wall surfaces such as Sikkens Alpha BL Grond.

The price includes and compensates for the formation of provisional works for the execution of the works in safety, and subsequent disassembly, the preparation of the surface with cleaning, occasional grouting, priming, primer, including touch-ups at the end of the work, the costs for the protection of the floor with nylon sheets, masking with wrapping paper and paper adhesive tape, of windows and doors in general, cleaning, separate collection of waste material, transfer of waste material to authorized landfills, landfill indemnity, compliance with the CE and DOP marking for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

30. LIFTING SYSTEM

30.1. Reference legislation

- Presidential Decree 459 of 24/07/96 and Application Circular 157296 of 14/04/97: Explanatory circular for the application of the Decree of the President of the Republic 24 July 1996, No. 459, to goods lifts and lifting platforms for the disabled.
- Ministerial Decree 2006/42/EC: Machinery Directive 2006/42 on the requirements for the manufacture, placing on the market and putting into service of machinery of various kinds, with a further draft regulation that implements the new regulations on lifts
- Legislative Decree 81: Consolidated Law on Safety - Implementation of Article 1 of Law No. 123 of 3 August 2007 on the protection of health and safety in the workplace
- UNI EN 81-50:2020 Safety rules for the construction and installation of lifts – Checks and tests – Part 50: design rules, calculations, checks and tests of lift components
- UNI EN 81-20:202 Safety rules for the construction and installation of lifts – Lifts for the transport of people and goods – Part 20: Lifts for people and goods accompanied by people
- UNI EN 81-20:2020 Safety rules for the construction and installation of lifts – Lifts for the transport of people and goods – Part 20: Lifts for people and goods accompanied by people
- UNI EN 81-70:2022 Safety rules for the construction and installation of lifts - Particular applications for passenger and goods lifts – Part 70: Accessibility of lifts by people, including people with disabilities
- UNI EN 81-72:2020 Safety rules for the construction and installation of lifts - Special applications for passenger and goods lifts – Part 72: Fire-fighting lifts
- UNI EN 81-73:2020 Safety rules for the construction and installation of lifts - Special applications for passenger and goods lifts - Part 73: Behaviour of lifts in the event of fire
- UNI EN 12015:2020 Electromagnetic compatibility - Standard for product family for lifts, escalators and moving walks - Emission
- UNI EN 12016:2013: Electromagnetic compatibility - Standard for product family for lifts, escalators and moving walks - Immunity

30.2. EL01 – Indoor Goods lift shaft 2 stop

Supply and installation of indoor Goods lift shaft of the KONE Transys DX C-process Loading C1 type with the following specifications:
Capacity: 5500 / 73 (kg/pers), decentralized load in the cabin permitted
Speed: 0.8 m/s
Travel: 3.65 m
Stops: 2
Shaft dimensions [W x D]:4100 x 3900 mm

Cabin dimensions: 2800 x 3270 x 3100 mm
Door dimensions: 2500 x 3100 mm
Finish for cabin door and internal cabin walls: Satin Stainless Steel
Floor: SS - Embossed Stainless Steel (E)
Ceiling: LF1 - with direct fluorescent light in satin steel F - Asturia
Cabin operating panel: Model KSC143 anti-vandal with amber-colored dot matrix
Landing operating panel: KSL140 - wall-mounted
The price includes and compensates for the construction drawings to be submitted for approval by the Construction Supervisor (D.L.), transportation of materials to the construction site, specialized labor for surveys, assembly of materials, and assistance during testing, final examination of the systems (95/16/CE), compliance with CE marking, and the Declaration of Performance (DOP) for construction products as required by Regulation No. 305/2011 (EU), and any other necessary elements to ensure the finished work meets high standards of craftsmanship.

The price includes and compensates for the construction drawings to be submitted for approval by the D.L., the transport of materials ex site, the specialized labor for surveys, assembly of materials and assistance with testing, the final examination of the systems (95/16/EC), compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work to workmanlike work.

30.3. EL02 – Indoor Goods lift shaft 4 stop

Supply Supply and installation of indoor Goods lift shaft of the KONE Transys DX C-process Loading C1
type with the following specifications:
Capacity: 5500 / 73 (kg/pers), decentralized load in the cabin permitted
Speed: 0.8 m/s
Travel: 3.65 m
Stops: 4
Shaft dimensions [W x D]:4100 x 3900 mm
Cabin dimensions: 2800 x 3270 x 3100 mm
Door dimensions: 2500 x 3100 mm
Finish for cabin door and internal cabin walls: Satin Stainless Steel
Floor: SS - Embossed Stainless Steel (E)
Ceiling: LF1 - with direct fluorescent light in satin steel F - Asturia
Cabin operating panel: Model KSC143 anti-vandal with amber-colored dot matrix
Landing operating panel: KSL140 - wall-mounted
The price includes and compensates for the construction drawings to be submitted for approval by the Construction Supervisor (D.L.), transportation of materials to the construction site, specialized labor for surveys, assembly of materials, and assistance during testing, final examination of the systems (95/16/CE), compliance with CE marking, and the Declaration of Performance (DOP) for construction products as required by Regulation No. 305/2011 (EU), and any other necessary elements to ensure the finished work meets high standards of craftsmanship.

The price includes and compensates for the construction drawings to be submitted for approval by the D.L., the transport of materials ex site, the specialized labor for surveys, assembly of materials and assistance with testing, the final examination of the systems (95/16/EC), compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work to workmanlike work.

30.4. EL04 – Kopron Special series loading ramp, dimensions 180x250cm

Supply and installation of Kopron Special series loading ramps, capacity 6000kg, dimensions 1800x2500mm, having the following characteristics and accessories:
- n° 1 Pair of side flaps size 150 mm/each for hinged lip
- n° 1 Ramp/door interconnection (with the door closed above the ramp, the latter does not work)
- n° 1 External vehicle presence sensor in position
- n° 1 Electrical control unit for signal management
- n° 1 Traffic light with two lights, red-green
- n° 1 Cable cover duct from floor to electrical panel
- n° 1 Hinged lip ramp electrical panel

Combined with self-supporting frame for vermiera-sealed lip ramp platform

The price includes and compensates for the construction drawings to be submitted for approval by the D.L., the transport of materials ex site, the specialized labor for surveys, assembly of materials and assistance with testing, the final examination of the systems (95/16/EC), compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work to workmanlike work.

31. SANITARY WATER SYSTEM

31.1. General

Execution of a complete water-sanitary system supplied and installed inside the toilets, downstream of the shut-off valves located in the room and up to the connections flush with the wall;
Assembly of sanitary appliances, taps, siphons, accessories and any other charge and magisterium to give the finished work in a perfect workmanlike manner; and any other charge and magisterium not specifically mentioned but necessary to give the finished work in a workmanlike manner

31.2. Sanitary

All equipment must comply with the sampling submitted and approved by the Works Management, must have adjustable water loading and unloading and be installed complete with all the accessories required for their perfect operation. Porcelain or other equipment must be accompanied by certificates from the manufacturers, to be presented together with the samples, on the quality and technical characteristics of the product, in particular the characteristics concerning water saving and recycling of the material at the end of its life.

31.3. Taps

All taps must be of the heavy type, of the best brands and of excellent quality and previously accepted, at the sole discretion, by the Works Management. All appliances must be equipped with a flow regulator, a certificate of origin, to be presented together with the sampling, certifying the quality and technical characteristics of the product, in particular the savings in water consumption.

31.4. Pipes and complementary parts

All appliances must be equipped with a certificate of origin, to be presented together with the sample, certifying the quality and technical characteristics of the product.

31.5. Measurement

The systems are calculated per unit, according to the type and characteristics described, the prices include and compensate for the connections downstream of the shut-off valve located in the room.
The uprights are not included in the prices charged to the system preparation unit.
Exhaust systems include all charges up to connection to the faecal column.

31.6. General equipment

For equipment in general, they will be evaluated by number according to their respective characteristics, types and capacity within the pre-established fields and according to the relative item described; masonry assistance, all accessories, to give the complete and functioning equipment in a workmanlike manner are included.

31.7. DW16, WD01 - Self-supporting HPL technical wall for WC division, changing rooms, 12mm thick

Supply and installation of a self-supporting HPL technical wall for toilet division and changing rooms in HPL, 12mm thick, including hinged doors.

Made of self-supporting stratified laminate panels, fire reaction class B-s2, d0 with slow flame propagation, halogen-free and UV-resistant, antibacterial, with low permeability that constitutes a barrier against possible emissions of formaldehyde and other volatile substances (VOCs) that can come from the wooden substrates that form the composite panel.
The compactness of HPL laminate ensures an excellent combination of mechanical characteristics such as resistance to bending, traction, compression and impact, resistant to humidity and scratches.
With colored finish surface chosen by the D.L. to be sampled for approval.
Placed on a substructure spaced 20cm from the finished floor level, total wall height 220cm with adjustable stainless steel foot fixed to the floor with concealed screws not visible from the outside.
Dividers complete with wall fixing using aluminum profiles.
The upper profile is integrated into the structure, solidly joins the front wall and is also present on the vertical wall.

Including supply and installation of doors raised from floor level, equipped with vertical stops complete with gaskets, self-closing hinges in silver oxidized aluminum, pawl with free/occupied indicator in stainless steel, with external key for emergency access.
Port size:
- WD01: 80x220cm.

The price includes and compensates for the sampling, survey, construction and positioning drawings of the various elements of the system, transport, assembly, various accessories, sealing with the building context, formation and disassembly of internal worktops, as well as compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary for give the finished work in a workmanlike manner.

31.8. PX01 – Wall-hung toilet bowl type Ceramica Globo Stockholm model

Supply and installation of a wall-hung ceramic toilet type Ceramica Globo Stockholm model or similar to be submitted to the approval of the D.L., with horizontal drain, compatible with 2/4 liter drains, dimensions 58x37cm, item code LAS02BI.
Including the supply and installation of the following elements:
- removable toilet seat cover in duroplast;
- double-button control plate;
- Drain cistern with reducer for built-in cisterns.

The finishes will be submitted to the approval of the DL/DA after sampling.
Including connections to the hot/cold water supply network, connection to the wastewater disposal network, fixing kit complete with stiffeners and supports in the masonry including plasterboard, siphon, drain, grid, perforations, cuts, adaptations on site and any other charge and accessory necessary to give the work complete, finished and functioning in a workmanlike manner.

31.9. PX02 – Floating toilet for the disabled type Ceramica Globo Silver model

Supply and installation of a wall-hung toilet for the disabled such as Ceramica Globo model Silver or similar to be submitted to the approval of the D.L., product code GEA2BI, laid flush with the wall, dimensions 70x37cm, weight 25kg, complete with hidden fixing.
Including the supply and installation of supplied elements, such as:
- removable toilet seat cover in duroplast;
- remote pneumatic control for the disabled;
- flush cistern and reducer for built-in cisterns;
- set of grab bars for disabled bathroom: reclining safety handle, diameter 32mm, thickness 2mm; horizontal safety handle L 60 wall-mounted, diameter 32mm, thickness 1mm; 70x40 wall-mounted corner safety handle, diameter 32mm, thickness 1mm.
The finishes will be submitted to the approval of the DL/DA after sampling.

Including connections to the hot/cold water supply network, connection to the wastewater disposal network, fixing kit complete with stiffeners and supports in the masonry including plasterboard, siphon, drain, grid, perforations, cuts, adaptations on site and any other charge and accessory necessary to give the work complete, finished and functioning in a workmanlike manner.

31.10. PX03 – Wall-hung ceramic washbasin

Supply and installation of wall-hung ceramic washbasin, laid flush with the wall complete with fixings, including the supply and installation of supplied elements, such as:
- chrome-plated drain with free drain for washbasins without overflow;
- Zucchetti single-lever mixer type Helm model or similar to be submitted to the approval of the D.L., with flow reducer at 1.7 litres/minute at 4 BAR and temperature reducer.
The finishes will be submitted to the approval of the DL/DA after sampling.

Including connections to the hot/cold water supply network, connection to the wastewater disposal network, fixing kit complete with stiffeners and supports in the masonry including plasterboard, siphon, drain, grid, perforations, cuts, adaptations on site and any other charge and accessory necessary to give the work complete, finished and functioning in a workmanlike manner.

31.11. PX04 – Wall-hung washbasin for the disabled type Ceramica Globo model Ausilia

Supply and installation of ergonomic single-hole washbasin with three holes, with elbow rests, without overflow hole, suspended installation for the disabled, such as Ceramica Globo model Ausilia or similar to be submitted to the approval of the D.L., dimensions 670x545mm, complete with fixings, including the supply and installation of supplied elements, such as:
- Chrome-plated drain with free flow for washbasins without overflow
- single-lever mixer with flow reducer at 1.7 litres/minute at 4 BAR and temperature reducer;
- chrome-plated siphon
The finishes will be submitted to the approval of the DL/DA after sampling.

Including connections to the hot/cold water supply network, connection to the wastewater disposal network, fixing kit complete with stiffeners and supports in the masonry including plasterboard, siphon, drain, grid, perforations, cuts, adaptations on site and any other charge and accessory necessary to give the work complete, finished and functioning in a workmanlike manner.

31.12. PX05 – Ideal Standard acrylic shower tray Ultra Flat model

Supply and installation of acrylic shower tray, Ideal Standard Ultra Flat model or similar to be submitted to the approval of the D.L., square in shape, dimensions 100x100cm and height 25mm, net weight 18.30 kg, laid flush with the floor, including rectangular drain dimensions 195x50mm.
The finishes will be submitted to the approval of the DL/DA after sampling.

Including connections to the hot/cold water supply network, connection to the wastewater disposal network, fixing kit complete with stiffeners and supports in the masonry including plasterboard, siphon, drain, grid, perforations, cuts, adaptations on site and any other charge and accessory necessary to give the work complete, finished and functioning in a workmanlike manner.

31.13. PX06 – Shower mixer with rod and shower head

Supply and installation of a shower mixer including rod and shower head, equipped with a flow rate reducer compatible with a flow rate of 5.7 litres/minute at 550 kPa, adjustable wall support, chrome finish.
The finishes will be submitted to the approval of the DL/DA after sampling.

Including connections to the hot/cold water supply network, connection to the wastewater disposal network, fixing kit complete with stiffeners and supports in the masonry including plasterboard, siphon, drain, grid, perforations, cuts, adaptations on site and any other charge and accessory necessary to give the work complete, finished and functioning in a workmanlike manner.

31.14. PX07 – Water drain for bathrooms

Supply and installation of a drain for the water of the bathroom rooms, dimensions 20x20cm, placed inside a removable siphon pipe to ensure the cleaning of the same, consisting of a 2mm thick lowered tank, inclined towards the drain pipe, welded to a 6mm thick flange, able to guarantee the driveability of the waste containers; 4 fixing brackets, for better positioning and anchoring to the floor.
Refer to the drawings of the plant project.

Mechanical assistance, construction of tracks, connections, solutions aimed at proper functioning are included and compensated; compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

31.15. PX09 – Polymer concrete drainage channel with integrated cast iron edge and cast iron grating bolted in place. Dim. W20xD100xH32

Supply and installation of drainage channel for rainwater collection, type Aco Series S 150 10.0 with integrated cast iron frame and cast iron grate, integrated bottom slope of 0.5%, consisting of a prefabricated channel in polymer concrete with drain preform, waterproof, with anti-freeze, anti-saline, anti-acid, resistant to oils and hydrocarbons and with a smooth internal surface suitable for ensuring a high flow rate.

The channel will be watertight up to the upper edge and will be equipped with a grating fixing system with 8 bolts/meter in steel. The system is completed with spheroidal GJS cast iron grates of the bridge type for load class D400 according to UNI EN 1433. Approximate height: 320 mm. Approximate width: 200 mm to be verified by the Contractor during the construction phase.

Mechanical assistance, construction of tracks, connections, solutions aimed at proper functioning are included and compensated; compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

31.16. FU05 – Reclining mirror for disabled bathrooms

Supply and installation of reclining mirror for disabled bathroom washbasin, laid on the wall, brand and model to be defined and submitted to the approval of the D.L.
Dimensions: 70x50cm.

Assistance for installation, transport, safe lowering of the material, formation and unravelling of internal worktops, compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner are included and compensated.

31.17. FU07 – Coplanar wall-mounted mirror size 150x95cm

Supply and installation of a coplanar wall mirror, custom made as per the project drawing, glued directly to the wall behind it before laying the ceramic covering.
Made of mirror glass, 3mm thick, including polymer accident prevention safety film, applied to the back of the glass.
Dimensions: 150x95cm.

Included and compensated are the verification of the flatness of the surface for flush-to-wall installation, assistance for installation, suitable adhesive, transport, safe lowering of the material upwards, the formation and disassembly of internal worktops, compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the work finished in a workmanlike manner.

31.18. FU08 – Coplanar wall mirror dimensions 75x95cm

Supply and installation of a coplanar wall mirror, custom made as per the project drawing, glued directly to the wall behind it before laying the ceramic covering.
Made of mirror glass, 3mm thick, including polymer accident prevention safety film, applied to the back of the glass.
Dimensions: 75x95cm.

Included and compensated are the verification of the flatness of the surface for flush-to-wall installation, assistance for installation, suitable adhesive, transport, safe lowering of the material upwards, the formation and disassembly of internal worktops, compliance with the CE marking and

the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the work finished in a workmanlike manner.

31.19. SE04 – Microwave Oven

Supply and installation of microwave oven, brand and model to be defined and submitted to the approval of the D.L.

Included and compensated are the sampling of the finishes, the technical data sheets of the appliances that must be in the appropriate energy consumption class chosen by the D.L., the transport and assembly of all the components, the connection of the appliances and taps to the power supply, the necessary assistance, testing, cleaning at the end of the work, and anything else necessary to give the finished work in a workmanlike manner.

31.20. SE05 – Refrigerator

Supply and installation of refrigerator, brand and model to be defined and submitted to the approval of the D.L.

Included and compensated are the sampling of the finishes, the technical data sheets of the appliances that must be in the appropriate energy consumption class chosen by the D.L., the transport and assembly of all the components, the connection of the appliances and taps to the power supply, the necessary assistance, testing, cleaning at the end of the work, and anything else necessary to give the finished work in a workmanlike manner.

31.21. SE06 – Dishwasher

Supply and installation of dishwashers, brand and model to be defined and submitted to the approval of the D.L.

Included and compensated are the sampling of the finishes, the technical data sheets of the appliances that must be in the appropriate energy consumption class chosen by the D.L., the transport and assembly of all the components, the connection of the appliances and taps to the power supply, the necessary assistance, testing, cleaning at the end of the work, and anything else necessary to give the finished work in a workmanlike manner.

32. CUSTOM-MADE FURNITURE

32.1. Object

The contract has as its object the supply, delivery and installation of custom-made furniture for the areas established in the project.
All the products must be complete with all the necessary predispositions for the wiring and power supply of each individual device.
The types, descriptions and dimensions of the furniture are shown in the Statement and in the attached drawings.
The furniture will be installed above the vinyl floor and may, in some cases, be anchored to walls or false ceiling or slab. Where necessary, any reinforcement of existing elements must be provided.

32.2. Premise

- All measurements are to be verified on site.
- The calculation and dimensional verification of the structural elements will be the responsibility of the contractor and will be defined during the Construction Project.
- All technical data and any quantitative indications reported in the project drawings are purely indicative. The contractor is therefore required to carry out the technical checks and calculations useful for the purpose of the work on the basis of the attached drawings and the general description of the furnishings listed in the Statement.
- The finishing works must meet the purpose of the same, according to the needs and intentions of the Client, which the Contractor must clearly understand from the examination of the technical documents attached to this description of the works, asking for clarification where he has doubts. If no doubts or perplexities are raised by the Contractor, the project will be considered included in all its peculiarities and/or particularities.
- All ancillary charges necessary for the fulfilment of this purpose of the work are understood to be included, even if not specifically included in this description: **therefore, the future recognition of any completion work that is omitted due to forgetfulness or for other reasons from the present offer is excluded.**
- Even where not expressly indicated, if necessary for the stability of the products subject to the tender, the supplier may provide auxiliary structures, including metal ones, or frames, duly hidden by the finishes provided for in the project.
- All the works described are understood to include and compensate, in the price displayed and/or offered, of all the works, works and charges necessary to carry out the works contracted in a workmanlike manner, even if not expressly defined in the project including packaging, unloading, transport to the floor, and installation costs.
- All products are considered compliant with current accident prevention regulations; All 90° fittings will be made with chamfers/rounds of at least 3 mm.

- All products must correspond to the provisions of the UNI 11675:2017 Standard Furniture - Design of furniture and their approaches to meet the needs of all people.

32.3. Furnishing and upholstery material requirements

The furnishing and covering materials will have fire reaction characteristics equivalent to the EUROCLASSES referred to in DD.MM. 10.03.05 – 15.03.05, as follows:

- In the halls, corridors, hallways, stairs, ramps, passages in general, 50% will be class 1, the remaining 50% class 0;
- These cladding materials, if combustible, will be installed in adherence to class 0 construction elements, excluding empty spaces or cavities;
- Materials likely to catch fire on both sides will be in class 1;
- Any wooden coatings, if not classified and approved at the origin, will be treated with approved class 1 paint products, according to the specifications reported in the Ministerial Decree 06.03.1992;
- The insulating materials, installed inside cavities, will be class 0.
- For upholstered furniture, a fire reaction class of 1IM must be guaranteed.

32.4. Contractor's obligation

Before starting production, it will be the Contractor's obligation:

- Carry out all the necessary inspections and surveys for each of the works to be carried out.
- Prepare construction drawings and exhaustive samples of the same until their final approval by the D.L. and the Client.
- Prepare at your own care and expense, samples of the specified materials and of different colors for approval by the D.L. and the Client.
- Check that each piece of furniture (or subdivisions that make up the individual piece of furniture) can be installed and loaded on the destination floor, checking on site the paths to the floor, including all the works necessary for the protection of the floors at the points of passage and processing.
- All the details, materials, finishes, colors, etc. indicated in the attached documents and drawings are preliminary and aimed at drafting the offers necessary for the definition of the tender. At a later stage, the company selected for the production of the furnishings is invited to discuss the details and examine the materials and their colours with the D.L.
- Indicate the estimated weight of the artifacts.

N.B. The Architectural Management, in agreement with the User, may provide at any time, during the course of the works, drawings, specifications and details that conform to the original project and relating to the works to be carried out, even if not expressly mentioned in this document and in the

attached documents; these documents can only be used to promote a better detailed understanding of some specific parts of the work already defined in the contract drawings .

Following the installation, it will be the Contractor's obligation:

- Arrange for the protection and packaging of all furnishings at their own care and expense, after checking the condition of the same countersigned with a delivery letter before installing the equipment.

32.5. Furniture technical features

All the proposed furnishings must be accompanied by technical data sheets with reference to the mechanical characteristics of the proposed finishes, resistance to wear, cleanability and maintenance. All proposed furnishings must be composed of class 1 materials (where existing Euroclass certifications are preferable), or class 0 where required by current legislation relating to fire prevention and safety.

32.6. Materials and finishes

The following materials and finishes will be used for the construction of the furnishings in question:

- The MDF panels used for the production of the furnishings must be made of high-density MDF, with a low formaldehyde content, class E1 according to UNI EN 13986, resistant to humidity according to EN322 and fire reaction class B s2, d0, in compliance with the EN13501-1:2001 standard and Ministerial Decree 26/6/84 and subsequent amendments, with guarantees to support any type of machining and drilling and receive any type of finishing, without altering fire reaction performance.
- All lacquered surfaces are intended to be finished with MDF panels, class min B s2, d0, reaction to fire.
- All laminated surfaces are intended as HPL in white, coloured single colour, or wood effect; in the colours chosen by the D.L. to be sampled for approval by the D.L., with joints in ABS in the same colour as the finish indicated.
- All laminated surfaces are supported by MDF panels, class B s2, d0 of reaction to fire th. 2/ 2.5 cm.
- Any wooden coatings, if not classified and approved at the origin, will be treated with paint products approved to Class 1, according to the specifications reported in the Ministerial Decree 06.03.1992
- All the internal parts **that are not visible** will be intended in melamine, the same colour as the visible parts of the same furniture, unless otherwise specified and in class B s2, d0 of reaction to fire.

- All bases and columns will be equipped with height-adjustable metal feet with nylon tips. The bases of the feet must be anchored to the base of the container with self-tapping screws.
- All the elements of the counters must be removable and inspectable, assembled with relative loops to ensure rapid intervention in case of maintenance and wiring.
- All drawers must be supplied with metal runners and complete with a slow-closing device (Bluemotion). Where indicated, the doors and drawers must be equipped with a cylinder lock with a double key that must be delivered to the Works Management with the reference of the counter and its container to which it refers. Supplied, for each counter supplied with drawers or doors complete with lock, two cylinders must be delivered for any maintenance.
- All the edges of the furniture must be worked with a 45° bevel without sharp edges, in compliance with current legislation

All the glass indicated is intended to be 5mm thick. All glass is intended to be tempered and ground on the edges and must comply with the provisions of the UNI 7697: 2015 standard Safety criteria in glass applications.

32.7. On-site adaptations

As custom-made works, the furnishings must include relative adaptations and infills to adapt to any possible out-of-squares, and must include relative seals to compensate for the technical assembly area provided between the plasterboard structure and the furnishings themselves.
The company awarding the furniture supply contract must carry out the relevant construction drawings at its own expense after verifying the building and plant preparations interfering or functional to the installation. Any anomalies during the definition of the furnishings must be communicated for approval to the Works Management, which will confirm their execution according to the instructions received.
The company awarding the furniture supply contract will have to interface with the Works Management for the special systems, to verify the relative receipts and rooms prepared for technological fittings. The furnishings, where necessary, must provide for predisposition for electrical and plumbing connections.

32.8. Compliance with Regulations and Certifications

All finishing works must be carried out with care.
The parts of the structure and finishing already carried out must be safeguarded which, if damaged during subsequent work, must be restored if necessary.
No damage must be caused to existing structures and systems.
The safety criterion must be respected both for the people operating (and the relevant regulations in force on the subject: Legislative Decree 81/08_ ex 626/94 and 494/96), and for existing parts of the system.
Therefore, all precautions must be taken to avoid dangerous situations that compromise the subsequent operation of plants and artifacts.

Neither common areas nor public land must be occupied without written authorization from the relevant managers.
In any case, the Contractor shall comply with all the Rules, Regulations and Laws in force in the execution of all works, relieving the Client of any liability, in particular:

- Reaction to fire: Class A1 (or '0' where required by law)
- Non-toxic: materials free of pollutants and harmful substances according to UNI EN 717/2-3/94
- Electrical safety: the possibility of equipping with systems will be guaranteed according to UNI 10815 and CEI 64.11 standards
- Safety in use: according to DL 626/94 and UNI 7697 for glazed parts.
- Structure strength: according to UNI 8201.
- Stability: according to UNI 8326.

In addition to the supply of the special furnishings themselves, the supplier must also provide for:

- Transport to the various floors, for which it is required that the supplier takes a prior view of the property and verifies the methods of transport to the floors, which must be indicated in the offer;
- Assembly of special furnishings as per attached layouts and drawings;
- Disposal of packaging cartons and waste material when the work is finished;

The site, in fact, must be left perfectly clean, tidy and free of rubble and waste material, both during the execution of the works and at the time of the final delivery of the premises, before and after the move and the installation of the furniture.
Assistance by a supplier manager, during transport and assembly, verification of the exact correspondence of the order to the supply, checking the integrity of the goods and replacing any defective or discordant elements.
All works must be carried out according to the **good rule of** the art, the evaluation of which is the exclusive responsibility of the supervisor of the quality of the works in question appointed by the Client, who is also responsible for the high supervision of the works and the verification of compliance with the project to be carried out and whose judgment on the quality of the same is unquestionable.

32.9. FU02 – Kitchen table, diameter 130cm

Supply and installation of circular kitchen table, diameter 130cm, height H 70cm, brand and model to be defined and submitted to the approval of the D.L.

Included and compensated are the sampling of the finishes, the transport and assembly of all the components, the necessary assistance, cleaning at the end of the work, and anything else necessary to give the finished work in a workmanlike manner.

32.10. FU03 – Seat with backrest for desk workstation

Supply and installation of seat with low backrest h 850/1000mm for workstation, to be sampled for approval by the D.L., consisting of:
- Structure in epoxy-polyester and/or polyamide powder-coated aluminium, black colour;
- Swivel seat with lumbar support, five-star base in powder-coated aluminium in the same colour as the structure, with swivel and self-braking wheels for textile floors.

- Adjustable seat height with gas pump;
- 2D height adjustable armrests, finish to sample. The mesh backrest must be equipped with a synchronised oscillation mechanism complete with anti-shock device and seat height adjustment system with 385/510mm travel.

Included and compensated are the sampling of the finishes, the transport and assembly of all the components, the necessary assistance, cleaning at the end of the work, and anything else necessary to give the finished work in a workmanlike manner.

32.11. FU04 – Office table, diameter 70cm

Supply and installation of circular office table, diameter 90cm, height H 70cm, brand and model to be defined and submitted to the approval of the D.L.
Included and compensated are the sampling of the finishes, the transport and assembly of all the components, the necessary assistance, cleaning at the end of the work, and anything else necessary to give the finished work in a workmanlike manner.

32.12. FU06 – Lockers for changing rooms

Supply and installation of lockers for changing rooms, custom made according to project design, to be properly anchored to the wall behind in order to avoid possible overturning, single element size: width 45cm, depth 35cm, for a total height of H 240cm, to be verified and submitted to the approval of the D.L., including white melamine structure and hinged doors with hidden hinges and electric lock.
Structure 25/30 mm thick, consisting of doors in MDF glossy lacquered color to be sampled for approval by the D.L.

Drawings as built, sampling of wood and handling accessories to be submitted to the approval of the D.L., the creation of mock-ups if requested by the Client and D.L., transport, lowering to the top, wall fixing if necessary and required, removal of packaging, final cleaning, certification of reaction to fire and anything else necessary to give the finished work in a workmanlike manner are included and compensated.

32.13. FU10 – Rectangular office table n° 4 workstations

Supply and installation of rectangular shaped office table, single unit size:
- depth 160cm
- width 80cm
- height H 70cm

For n° 4 workstations, brand and model to be defined and submitted to the approval of the D.L.

Included and compensated are the sampling of the finishes, the transport and assembly of all the components, the necessary assistance, cleaning at the end of the work, and anything else necessary to give the finished work in a workmanlike manner.

32.14. FU12 – Meeting room table

Supply and installation of rectangular meeting room table, dimensions depth 160cm, width 320cm, height H 70cm, brand and model to be defined and submitted to the approval of the D.L.

Included and compensated are the sampling of the finishes, the transport and assembly of all the components, the necessary assistance, cleaning at the end of the work, and anything else necessary to give the finished work in a workmanlike manner.

32.15. FU13 – Single workstation office table

Supply and installation of office table for single workstations, rectangular in shape, dimensions:
- depth 180cm
- width 120cm
- height H 70cm

Brand and model to be defined and submitted to the approval of the D.L.

Included and compensated are the sampling of the finishes, the transport and assembly of all the components, the necessary assistance, cleaning at the end of the work, and anything else necessary to give the finished work in a workmanlike manner.

32.16. FU14 – Kitchen seat

Supply and installation of kitchen seat, brand and model to be defined and sampled for approval by the D.L., dimensions width 49cm, depth 56cm, height with backrest 82cm.

Included and compensated are the sampling of the finishes, the transport and assembly of all the components, the necessary assistance, cleaning at the end of the work, and anything else necessary to give the finished work in a workmanlike manner.

32.17. FU15 – Custom Kitchenette Module – KITCHEN WORKTOP MODULE

Supply and installation of a kitchenette module with work surface, custom made as per the project drawing, consisting of:
- module with hinged door and internal shelves;
- MDF top, HPL laminate finish;
- structure of all elements in MDF, HPL laminate finish;
- size: 60x60x90cm;
- skirting board H 5cm set back from the edge of the cabinet by 6cm;

The finishes of the furniture are chosen by the D.L., to be sampled for approval.

Included and compensated are the drawings as built, the sampling of the finishes, the technical data sheets of the appliances that must be in the appropriate energy consumption class chosen by the D.L., the transport and assembly of all the components, the connection of the appliances and taps to the power supply, the necessary assistance, testing, cleaning at the end of the work, and anything else necessary to give the finished work in a workmanlike manner.

32.18. FU16 – Custom Kitchenette Module – KITCHEN MODULE WITH SINK

Supply and installation of a kitchenette module with sink, custom made as per the project drawing, consisting of:
- module with built-in steel sink, including siphon and single-lever mixer tap for kitchen;
- MDF top, HPL laminate finish;
- structure of all elements in MDF, HPL laminate finish;
- size: 60x60x90 cm;
- skirting board H 5 cm set back from the edge of the cabinet by 6 cm.
The finish of the cabinet as well as the sink, taps and appliances are chosen by the D.L., to be sampled for approval.

Included and compensated are the drawings as built, the sampling of the finishes, the technical data sheets of the appliances that must be in the appropriate energy consumption class chosen by the D.L., the transport and assembly of all the components, the connection of the appliances and taps to the power supply, the necessary assistance, testing, cleaning at the end of the work, and anything else necessary to give the finished work in a workmanlike manner.

32.19. FU17 – Pass documents in RC3 class

Supply and installation of document passers in class RC3 type SIMES model Simes-F16 or similar to be sampled for approval by the D.L., made entirely of press-bent stainless steel sheet, suitable for fixtures or walls with a maximum thickness of 140mm.

Including all the materials and processes for correct installation, assistance for installation, transport, safe lowering of the material, formation and unraveling of internal worktops, compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

32.20. FU19 – Bench for changing room. Dimensions 175x40x45 cm

Supply and installation of bench for dressing room, materials, accessories, finishes and dimensions as per interior design drawings, to be coordinated with the Work and Artistic Directors, subject to approval after sampling.
Dimensions: 175x40x45 cm.
Including stain-resistant, anti-mould surface treatment and fire-retardant treatment for wood.

Including all the materials and processes for correct installation, assistance for installation, transport, safe lowering of the material, formation and unraveling of internal worktops, compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

32.21. FU20 – Office table, dimensions height 72 cm, depth 250 cm, width 140 cm

Supply and installation of Office table, dimensions height 72 cm, depth 250 cm, width 140 cm, type and model to be defined.

Including all the materials and processes for correct installation, assistance for installation, transport, safe lowering of the material, formation and unraveling of internal worktops, compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

32.22. FU21 – Office chair

Supply and installation of chair with low back h 850/1000 mm, for work station, made of epoxy-polyester and/or polyamide powder coated aluminium structure, black coloured, swivel seat with lumbar support, 5-spoke base in aluminum powder-coated in the same color of the structure, with swivel wheels and self-braking for textile floors. Adjustable seat height with gas pump; 2D height adjustable armrests, finish to be sampled.
The mesh backrest must be equipped with a synchronized oscillation mechanism complete with anti-shock device; seat height adjustment system with 385/510mm travel.

Including all the materials and processes for correct installation, assistance for installation, transport, safe lowering of the material, formation and unraveling of internal worktops, compliance with the CE marking and the PDO Product Production Declaration for construction products provided for by Regulation no. 305/2011 (EU) and anything else necessary to give the finished work in a workmanlike manner.

33. INSTALLATION

33.1. General rules

The installation of any material, apparatus or artifact will generally consist of its removal from the place of storage, its transport to the site (meaning both flat or sloping transport, and lifting up or down, all carried out with any aid or mechanical means, provisional work, etc.). as well as in the placement in the exact place of destination, at any height or depth and in any position, and in all the consequent works (cutting of structures, fixing, adaptation, grouting and reductions in pristino).
The installation must be carried out with all the necessary care and caution; the material or artifact must be suitably protected, if necessary, even after it has been placed, the Contractor being solely responsible for damage of any kind that may be caused to the things installed, even from the traffic of workers during and after the execution of the works, until their completion and delivery, even if the particular installation takes place under the supervision or assistance of the personnel of other companies, suppliers of the material or product.

33.2. Placement of iron products

Iron products, such as door frames, windows, stained glass, etc., will be placed on site by fixing them to the support structures by, depending on the case, iron clamps, or screws secured to wooden dowels or duly walled counterframes.
In the case of fixtures of any type equipped with a counterframe, the Contractor will be obliged, at the request of the Works Management, to carry out the early installation of rustic masonry.
The on-site assembly and placement of the large carpentry works must be carried out by specialist workers in sufficient numbers so that the work proceeds with the necessary speed. The assembly must be done with the utmost precision, suitably touching up those elements that are not in perfect contact with each other and taking into account the effects of thermal variations.
Finally, it must be borne in mind that the materials making up the works of large carpentry, etc., must all be completely recoverable, without breakdowns or losses.

33.3. Placement of aluminium products

The assembly of the various parts making up the window frame will be carried out in accordance with the project drawings and with the approved workshop drawings.
The utmost care must be taken to ensure that all exposed materials are finished in the same colour and have a similar appearance.
In the case of windows anodized with black or dark brown electrocolor or painted in medium-dark colors, exact indications must be provided on the method to be followed for the realization of the paper-paper joints, in order to avoid the sight of the natural color that appears from the painted surfaces following an imperfect flatness of the same surfaces that contribute to the joint.
The holes for attaching the frame to the counter frame must be drilled before anodizing, in order to avoid discontinuity in the anodizing itself.
The counter frame must be secured to the masonry work by means of anchors with a maximum distance of cm. 60. It is understood that the counter frames must arrive at the site in time to be assembled in relation to the progress of the masonry work.
The fixing of the frame to the counter frame must be guaranteed by self-tapping and drilling stainless steel screws, equipped with appropriate rubber or plastic gaskets, with a maximum distance of cm.

60 in such a way that the anchor is at the same level as the screw of the frame of the frame. The frame of the window must be equipped with special adjustable spacers.
The compartments and surfaces that must receive the windows must be plumb, leveled and arranged in the right direction. No installations will be carried out until the rooms and surfaces are in satisfactory condition.
The windows must be assembled and adjusted by specialized workers, according to the instructions given by the manufacturer.
Mortar, dirt, dust and any foreign material must be carefully removed from the surfaces on which the sealing is to be carried out. The application will be done by filling the cracks well and creating a smooth and well-leveled surface.
After the installation of the windows, the doors and closures must be overhauled, so that they work without friction and the closure is perfect.
The moving parts must be properly lubricated, the gaskets and sealing profiles must not cause jams. Unless the D.L. approves different solutions, all fasteners will not be visible externally.
During installation, all joints, overlaps, etc. will be sealed with mastic or sealing gaskets, according to the factory instructions approved by the D.L. and in any case required to obtain the perfect seal. The seals will be polysulfidic or silicone-based, the colors will be those chosen by the D.L.
The supply must include the provision for the connection of the windows and doors that will have electrical continuity, to points prepared for earthing. This arrangement will be obtained by means of a special external ear fixed to the window and drilling.

33.4. Placement of marble and stone artifacts

Both in the event that the supply of the products is entrusted directly to him, and in the event that he is entrusted with the installation only, the Contractor must take the utmost care to avoid, during the various operations of unloading, transport and placement on site and up to testing, breakages, chips, scratches, damage to polishing, etc. He must therefore provide at his own expense for the appropriate protections, with suitable material, of edges, frames, columns, steps, floors, etc., remaining obliged to repair any damage found at his own expense, as well as to compensate for its value when, in the unquestionable judgment of the Works Management, the repair is not possible.
To anchor the various pieces of marble or stone, clamps, pins and brackets will be used, in galvanized or tinned iron, or even in brass or copper, of a type and size suitable for the purpose and the stresses to which they will be subjected, and to the liking of the Works Management.
These anchors will be firmly fixed to the marble or stone within special recesses of suitable shape, preferably by means of molten lead and beaten with a mallet, and walled into the supporting walls with cement mortar.
The voids that will result between the stone or marble cladding or the masonry behind it must be diligently filled with fine hydraulic mortar or brick, sufficiently fluid and duly thrown, so that no gaps of any magnitude remain. The same mortar will be used for bedding flat slabs for floors, etc.
The use of fast-setting cementitious agglomerating agent is prohibited, both for laying and for the temporary fixing of the pieces, as well as the use of cement mortar for bedding the marbles.
The Contractor must use special care and appropriate measures for the fixing or support of jambs, lintels, cladding, etc., in which the pieces are suspended from the structures in general and from those in reinforced concrete in particular; in this case, it may be requested that stones or marbles be placed in place before casting, and incorporated with appropriate means into the mass of the masonry

or conglomerate, all following the special rules that will be given for this purpose by the Works Management and without the Contractor having the right to claim special compensation.
All the artifacts, of any kind, must be placed on site in the exact position established by the drawings or by the Works Management; The connections and connections, made in perfect match according to the best rules of the art, must be filled with white or colored cement, depending on the case, so as to be as inconspicuous as possible, and care must be taken to remove any wedge or wooden wedge at the end of the installation.
The upper floors of the stones or marbles placed outside must have the appropriate slopes to convey rainwater, according to the indications given by the Works Management.
In any case, it will be the responsibility of the Contractor, even when he is only in charge of the installation, to reduce and modify the masonry and frameworks and to carry out the necessary chiselling and forfeitures, so as to allow the perfect installation of marble and stone of any kind.
In the case of external cladding, it may be required that the installation of the stones or marbles immediately follows the progress of the masonry, or that it be carried out at a later time, without the Contractor being able to claim special compensation beyond those provided for in the tariff.

33.5. Installation of glass and crystals

The installation of tempered glass windows, simple and tempered glass and half glass, laminated glass, double or semi-double glass, wired glass, etc., must be carried out at any height and in any position and must be completed by a perfect cleaning of the two sides of the sheets themselves, which must be perfectly shiny and transparent. The glass in general can be mounted on iron or aluminum profiles and on special ones or with rubber or expanded resin or neoprene gaskets, including EPDM type or with glazing beads fixed with screws. The assembly must be carried out in a workmanlike manner to avoid any vibration. On windows made with profiles, the required glass can be mounted in the factory by inserting and blocked along the perimeter with load-bearing dowels and spacers, and finally filled with injection. In any case, the glass must be placed in the windows in such a way as to prevent it from escaping from its seat under the action of the forces to which it will be subjected in exercise: self-weight, wind pressure and depression, etc. The company is obliged to check the orders for the various types of glass indicated in the project or by the DL, noting their exact measurements and quantities, and to report any discrepancies to the latter, remaining entirely at its own expense any inconvenience that may arise from the omission of such control.

34. RULES FOR THE MEASUREMENT OF WORKS

34.1. General regulations

Unless otherwise indicated in the individual works or in the Contract, the quantity of the works carried out will be determined using geometric methods, or by weight, excluding any other method.

34.2. Demolition, removal and dismantling

Demolitions, removals and dismantling will be evaluated by adopting the unit of measurement compatible with the operation in question: m³, m², m, kg, each.
In addition to the costs relating to general expenses and business profits, the prices of the works must also include those relating to the execution with methods and precautions suitable for guaranteeing the safety and hygiene of the works, not damaging the neighboring works and artifacts, not causing disturbance or harassment and wetting the resulting materials so as not to raise dust: charges relating to provisional works must not be included.
The horizontal or vertical movements of the resulting materials (derailments, lowering, transport) when not included in the items reported, will be evaluated per m³, including the increase relative to the increase in the volume of the loose material.
The estimate of the lower descent with a mechanical elevator with a capacity of up to 500kg, when not included in the items reported, will be applied only when the use of the equipment in question is verified with the presence of two operators responsible for loading and unloading the resulting materials.
The estimate of the approach to the place of temporary storage, pending transport to unloading, when not included in the prices reported, can only be applied in the case of loose material from demolitions and in the following situations:
Work at height with approach to the shooting castle for the descent down with a mechanical elevator
Transport to the loading floor, up to the area designated for the collection of the same (when this is expressly indicated by the Works Management or in any case requires an appropriate collection area)
The criteria for the application of these estimates, in relation to the type of movement analyzed, must perform the following criteria:
Handling with small mechanical vehicles: for transports that can be carried out with small machines with a capacity of up to 1 m³ (dumpers, forklifts equipped with buckets, etc.) on routes that can be traveled with these types of vehicles.
Unloading: for transport by wheelbarrow or similar means conducted by hand, on routes that cannot be passed by small mechanical vehicles, considering overall both the possible journey to the vehicle designated for the lower lower, and the one made on the loading floor to the place of collection of the resulting material.
Shelling and/or bagging: for transport by hand, by means of buckets or bags, of the resulting material when, regardless of the Contractor's operational capacity, other types of handling are not practicable (non-wheelbarrow routes and the impossibility of exploiting, due to the lowering down, some types of mechanical means).
The prices set in the tariff in the case of demolitions involving entire buildings may be set prices per empty cubic meter per full.
These prices include fees for the charges and obligations specified in the items of "Demolition and removal" and in particular the selection, stacking and transport of materials to waste.

For some demolitions and removals, the measurement can also be carried out by linear meter, by weight or each.

34.3. Masonry in general

All masonry in general, with the exceptions specified below, will be measured geometrically, by volume or surface, according to the category, on the basis of measurements taken on the live of the walls, i.e. excluding plaster. Deduction will be made of all voids with a span of more than 1.00 m² and voids of flues, ducts, etc., which have a section of more than 0.25 m², the Contractor being responsible for closing them with terracotta material. In the same way, the volume corresponding to the interlocking part of pillars, platforms, etc., of different structures, as well as of natural or artificial stones, to be paid for with other tariff prices, will always be deducted.
The prices of masonry of any kind include any charge for the formation of abutments, spurs, reeds, edges, splays, embedding for the imposts of arches, vaults and platforms.
Whatever the curvature given to the plan and sections of the walls, even if they have to be built under radius, the relative masonry cannot be included in the category of vaults and will be evaluated with the prices of broken masonry without any additional compensation.
The frameworks of cornices, cornices, pilasters, pillars, etc., with an overhang of more than 5 cm on the outer edge of the wall, will be evaluated for their actual overhanging volume with the application of the tariff prices established for masonry. No surcharge will be applied for overhang frameworks of less than 5 cm.
When the overhanging masonry is different from that of the wall on which it stands, the interlocking part will be considered as being of the same kind as the wall itself.
Brick masonry with one head or sheet will be measured empty for full, rustic, deducting only openings with a surface area equal to or greater than 1 m², meaning in the compensated price the formation of vaults, abutments, platforms, etc., as well as any wooden frames that the Works Management deems appropriate to order in order to fix the windows to the frame, instead of on the wall.

34.4. Exposed façades

The prices established in the tariff for the processing of the visible faces that are to be paid separately from the masonry include not only the fee for the processing of the visible faces, the laying and matching surfaces, but also that for any higher cost of the covering stone, if this is expected to be of different quality and origin from those of the material used for the construction of the internal masonry.
The measurement of stone facings and brick curtains will be carried out for their actual surface, minus the voids and the parts occupied by cut or artificial stone.

34.5. Cut stone works

The cut stone to be paid by volume will always be evaluated per cubic meter based on the volume of the first rectangular rectangular parallelepiped, which can be circumscribed to each piece. The slabs, slabs and other pieces to be paid for per surface will be evaluated on the basis of the minimum circumscribable rectangle.
For stones of which a part is left unfinished, this will also be included in the measurement, but no account will be taken of any larger protrusions of the unworked part in comparison with the dimensions assigned by the prescribed types.

For the categories of stone works to be evaluated by surface, this will be obtained by adding the surfaces of the smallest rectangles or squares that can be circumscribed to each piece.
For the categories of stone works to be evaluated with a linear development, the measurements on site must not take into account any forfeitures, joints or the like.
The relative list prices shall always include all the charges specified in the standards on materials and methods of execution.

34.6. Suspended ceilings

Flat ceilings will be paid based on the surface area of their horizontal projection. Also included and compensated in the price is the connection with any curved perimeter walls, all supplies, magisterium and means of work to give false ceilings finished on site as prescribed in the regulations on materials and methods of execution including the load-bearing framework.

34.7. Waterproofing

The works are valued at the actual surface with deduction of voids or non-waterproofed parts having a single surface area greater than 0.50 m².
In addition to the insurance charges on accidents at work, etc., the prices of the works also include those for their execution with order and precautions suitable for not damaging the remaining works and artifacts.

34.8. Screeds, crawl spaces, drainage

The works are valued per cubic meter of materials in place, with the exception of cement screeds and brick crawl spaces, to be paid per actual surface area unless otherwise indicated.
The prices of substrates and drainage generally include any charge for the supply of materials and for installation as prescribed in the rules on the methods of execution.

34.9. Floors

The measurement of floors of any kind, with the exception of those in stone material, will develop according to the visible surfaces and therefore without taking into account the parts that are in any case recessed or actually under plaster; unpaved areas must also be deducted, provided that they have a surface area of more than 0.50m² each.
The list prices for each type of floor include the cost for the supply of materials and for any work intended to give the floors themselves complete and finished as prescribed in the standards on materials and methods of execution. In each of the prices concerning the floors, even in the case of installation only, the charges are included, the restoration works and the connection with the plasters, whatever the extent of the works themselves.
When the work is completed, the surfaces of the floors must be perfectly flat and with those slopes required by the drawings and construction details; the floors must be free of stains of any kind and the slightest inequality between the connections of the different elements in contact.
For the evaluation of marble floors, please refer to the chapter "Cut stone works".

34.10. Coatings

Coatings in general, with the exception of those in stone material, will be measured for the actual surface regardless of the shape and position of the walls to be covered. The price per square meter

includes the supply and installation of all special pieces of connection, corners, etc., which will be calculated in the measurement, as well as the cost for the prior preparation with mortar of the walls to be covered, the final grouting of the joints and the supply of adhesive for coatings.
When the work is completed, the surfaces of the coatings must be vertical; devoid of stains of any kind and the slightest inequality between the connections of the different elements in contact.

34.11. Marble, natural and artificial stone

The prices for the supply of marble and natural or artificial stone, provided for in the list, will be applied to the actual surfaces of the materials on site.
Any charge deriving from compliance with the rules prescribed in the Specifications is included in the prices.
Specifically, these prices include the costs for the supply, unloading on site, storage and temporary protection in storage, pick-up, subsequent transport and lifting of materials at any height, with possible protection, covering or wrapping; for each subsequent lifting and for each re-installation with cement grout or other material, for the supply of lead plates, clamps, brackets, rules, keys, pins necessary for fixing; for any necessary chiseling of the masonry structures and for the subsequent closure and resumption of the same, for the grouting of the joints, for the accurate and complete cleaning, for the protection by means of appropriate temporary works of the stones already placed in place, and for all the works that may be necessary for the perfect finishing after installation.
The list prices also include the cost of padding the compartments behind the pieces, between the pieces themselves or in any case between the pieces and the masonry works to be covered, in order to obtain a good connection, and, where required, a perfect fit.

34.12. Plasters

The prices of plasters will be applied to the plastered surface without taking into account the side surfaces of protrusions, pilasters and the like. However, these side surfaces will also be evaluated when their width exceeds 5 cm. They will apply to both flat and curved surfaces. The execution of connecting shells, if required in the corners between walls and ceiling and between walls and walls, with a radius not exceeding 15 cm, is also included in the price, taking into account that the plasters will also be measured in this case as if there were sharp edges.
The price of plaster includes the cost of removing, after closing, traces of any kind, masonry, any hooks to the ceiling and counter-flooring, plinths and window frames.
The prices in the list also apply to plaster on hollow brick masonry with the thickness of one head, as they include the burden of clogging the holes in the bricks.
The internal plasters on walls thicker than 15 cm will be calculated empty by full, compensating for the plaster in the squares of the rooms, which will therefore not be developed.
However, rooms with a surface area greater than 4 m² will be deducted, evaluating the squaring of these rooms separately.
Interior plaster on sheet partitions or single-head partitions will be counted for their actual surface; all voids of whatever size must therefore be deducted, and their squares added.
Plasters on sloping ceilings, vaults, domes, etc., are evaluated according to the actual surface of application.
No special compensation will be due for the plastering carried out in small sections even in correspondence with the abutments and bundles of door and window openings.

34.13. Decorations

The decorations, depending on the case, will be measured by linear meter or square meter.
The prices of the frames, bands and exhibitions are applied to the surface obtained by multiplying the linear development of their profile (excluding the slopes and friezes) by the length of their most protruding members. The price itself includes the fee for working the edges.
To compensate for the greater workmanship of the protrusions, the length measurement will be increased by 0.40 m for each protrusion. Only those determined by pilasters, pillars and architectural detachment lines that require a double profile, salient or recessed, are considered prominent.
The friezes and the rainfall of the frames, with or without sketch, and even if shaped and profiled, will be paid separately with the corresponding list prices.
The ashlars, however cast, and the coffers, whatever their depth, will be measured according to their projection on a plane parallel to the background face, without taking into account the increase in surface area produced by the overhang of the ashlars or the depth of the coffers.
The prices of the ashlars will remain unchanged regardless of the size, the configuration of the drafts and their arrangement in series (continuous or discontinuous).
The price of all decorations includes the cost of the skeleton, as long as the frames, bands and displays do not exceed 5 cm overhang, for the sketching of the ashlars, for the retouching and perfecting of the skeletons, for the curling of mortar, for the plaster of stucco precisely profiled and polished, for the moulds, casts, models, forms, dead prints, for the execution of the samples of the work and for their modification at the request of the Works Management, and finally for anything else necessary to bring the stucco works perfectly to completion.

34.14. Paint works

The prices of painting, colouring and varnishing in general include all the charges prescribed in the regulations on materials and methods of execution of the Specifications as well as those for means of work, transport, removal and re-threading of fixtures, etc.
The painting of walls, ceilings, false ceilings, veils, vaults, etc., is measured according to the actual surfaces, but without taking into account the side surfaces of protrusions, pilasters or the like that have protrusions not exceeding 5 cm. For walls thicker than 15 cm, the painted surfaces are considered empty by full, compensating for the squaring of the ani, which are not calculated separately: however, voids with surfaces greater than 4 m² each are deducted, calculating the relative squaring separately.
Painting on masonry or similar surfaces is measured with the same criteria as indicated above for painting.
On metal, wooden or similar works, the paints are conventionally evaluated by applying the following coefficients to the surfaces of the individual elements mentioned below, they are intended to be carried out on both sides and measured in a straight projection, i.e. without taking into account thicknesses, mouldings, etc.

- Simple and unadorned metal works, such as large windows, skylights, mesh roller shutters and the like: coefficient 0.75; three quarters of their total surface will therefore be calculated, always measured in projection, thus considering the colouring of the supports, clamps and similar accessories to be compensated, which will not be taken into account in the measurement;

- Normal glazed windows such as windows, French doors, glass doors, glass doors, etc.: coefficient 1.00; the actual total surface area will then be computerized, always measured in projection. For all windows and doors, the surfaces to which the above-mentioned coefficients are applied are those measured on a case-by-case basis, according to the standards reported in the Chapters of wooden windows and metal windows.
- Normal metal works, such as railings, gates, including reducible gates, railings and the like: coefficient 2.00; their entire surface will therefore be calculated twice, always measured in projection, thus considering the colouring of the supports, clamps and similar accessories to be compensated, which will not be taken into account in the measurement;
- Corrugated sheet metal or sheet metal roller shutters: coefficient 2.50; the net span of the space, in height, between the threshold and the beating of the shutter will therefore be calculated two and a half times, meaning that the colouring of the surface not visible is also compensated.
- Roman shutters and chest of drawers, sheet metal roller shutters: coefficient 3.00; three times their entire surface will therefore be calculated, always measured in projection.
- Doors, compasses, flaps and the like: coefficient 2.00; The net light of the window frame will therefore be calculated twice, in addition to the exhibition or the spig, if there are any, without deducting any surface of the glass. This also includes the painting of the frame for large walls or the Roman-type chest of drawers for partitions and the Lombard-type upholstery, also for partitions. The measurement of the exhibition and the sleash will be carried out in projection on a vertical plane parallel to the mean plane of the compass (closed) without taking into account silhouettes, protrusions or turn-ups;

All colouring or varnishing is intended to be carried out on both sides and with the respective list prices the colouring or varnishing of pawls, armrests and similar accessories is also considered to be compensated.
The application of the lining and wallpaper paper will be measured only for the surface of the covered wall, i.e. without taking into account overlaps, and the relative price includes any charge for the complete execution of the work in all its parts.

34.15. Glass, glass and the like

The measurement of the glass and crystals is carried out on the sheets in place, i.e. without taking into account any scraps that may have occurred to obtain their actual dimensions. The price includes the mastic, the tips for fastening, the plates and any rubber gaskets prescribed for the iron frames.
For non-rectangular or square elements, for glass and ribbed glass, the surface of the smallest circumscribable rectangle is assumed.
The installation of the glass will be liquidated according to the surface.
Prices must include all charges for installation.

34.16. Fixtures and doors

The installation of fixtures and windows will be paid according to the surface. For the installation of fixtures, windows and similar structures, the prices must include all charges. All fixtures and windows must always be equipped with support and closing hardware, wall sprinkles, knobs, handles and any accessory necessary for proper operation.

34.17. Wooden window frames

Fixtures, such as doors, windows, glazing, roller covers and the like, will be measured from a single side on the external perimeter of the frames, whether they are simple or coffers, without taking into account the paws to be recessed into the floors or thresholds. The ribbed parts will be evaluated according to the surface of the minimum circumscribed rectangle, with the frame closed, included as above the main frame, if any. The price of the fixtures includes exhibitions and counter-exhibitions.
The thicknesses indicated in the various items of the tariff are those that must be shown when the work is completed.
All fixtures must always be equipped with support and closing hardware, wall sprinkles, handles and any other accessory necessary for their proper functioning. They must also correspond in every detail to the samples approved by the Works Management.
The prices listed include the supply of the window and related accessories mentioned above, the cost of unloading and transport to the individual rooms of destination and installation.

34.18. Aluminium windows

Aluminium fixtures, such as windows, entrance glazing, doors, curtain walls, will be evaluated either by each element or by the square metre of surface area measured outside the exhibitions and architraves and compensated with the respective list items. The prices include the counterframes to be walled up, all the hardware and any floor pumps for the automatic closing of the windows, as well as all the charges deriving from compliance with the standards and requirements contained in the standards on materials and methods of execution.

34.19. Metal works

All metal works will generally be valued by weight and the relative prices will be applied to the actual weight of the metals themselves when the work is completely completed and determined before their installation, with direct weighing done in contradictory and at the expense of the Contractor, excluding painting and colouring from the weight.
The prices of metalwork include any and all compensation for accessory supplies, for machining, mounting and position on site.
The prices of metalwork include any and all compensation for accessory supplies, for machining, mounting and position on site.
The following are also included and compensated:

- The execution of the necessary holes and joints in the masonry and cut stones, the splices and sealings, the mortars and cement, as well as the supply of lead for the splices;
- The charges and expenses deriving from all the standards and requirements contained in the paragraph "Works in steel and other metals";

the coloring with lead and cooked oil, the pulling and transport to the top, or the descent down, and everything necessary to give the work done on site at any height.

In particular, the prices of iron beams with any profile for floors, platforms, supports, connections, etc., are also valid in the case of exceptional length, size or cross-section of the same, and of types for which a specific manufacture is required. They compensate, in addition to the pulling and transport upwards, or the descent downwards, all the drillings, cuts, workings, etc., necessary to connect the heads of all the beams of the floors with rods, tie rods, reinforced concrete curbs, or to apply keys, key covers, bolts, brackets, windings, bolts, nails, etc., all the works to secure the beams to the supporting walls, or to connect two or three beams to each other, etc., and any other work prescribed by the Works Management for the perfect success of the floors and to make the beams exercise the function of connecting the walls on which they rest.
In addition to the processing and any scrap, the price of iron for reinforcement of reinforced concrete works includes the cost of tying the individual elements with iron wire, the supply of the iron wire, and the installation of the reinforcement itself.

34.20. Manpower

The workers for economic work must be suitable for the work for which they are required and must be equipped with the necessary tools.
The Contractor is obliged, without any compensation, to replace all those workers who are not to the liking of the Works Management.
With regard to the provision of labour, the provisions and agreements established by the laws and collective labour agreements, stipulated and validated in accordance with the laws on the legal discipline of collective relations, will be observed.
In carrying out the works covered by this contract, the company undertakes to apply in full all the rules contained in the national collective labour agreement for workers employed by industrial construction and similar companies and in the supplementary local agreements thereof, in force for the time and place where the aforementioned works are carried out.
The company also undertakes to apply the contract and the agreements themselves even after their expiry and until replacement and, if cooperative, also in relations with members.
The aforementioned obligations bind the company even if it is not a member of the contracting associations or withdraws from them and regardless of its industrial nature and any other legal, economic or trade union qualification.
The company is responsible in relation to the contracting authority for compliance with the aforementioned rules by any subcontractors towards their respective employees, even in cases where the collective agreement does not regulate the hypothesis of subcontracting.
The fact that the subcontract is or has not been authorized does not exempt the company from the liability referred to in the previous paragraph and this without prejudice to the other rights of the contracting authority.
In any case, orders given by the company to other companies are not considered subcontracts:
a) for the supply of materials;
b) for the supply, also on site, of special products and systems that are carried out by means of specialized companies.

34.21. Rentals

Machinery and equipment rented out must be in perfect serviceability and equipped with all the accessories necessary for their regular operation.

The Contractor is solely responsible for the maintenance of the tools and machines.
The price includes the costs relating to labour, fuel, lubricants, consumables, electricity and everything necessary for the operation of the machines.
The rental prices of mechanisms in general are intended to be paid for the entire time during which the mechanisms remain at the disposal of the Administration, i.e. also for the hours in which the mechanisms themselves do not work, the price established for mechanisms in operation being applied only to the hours in which they are in work activity; the one relating to mechanisms at rest in any other condition of things, even for all the time taken to heat the boiler and to bring the mechanisms up to speed.
The rental price includes and compensates for the charges and all the expenses for the transport to the site, assembly, disassembly and removal of the said mechanisms.
For the rental of wagons and trucks, the price will be paid only for the hours of actual work, excluding any compensation for any other cause or loss of time.

34.22. Transport

Unless otherwise specified in the contract, transport prices include the loading and unloading of materials from the means of transport, as well as insurance of all kinds, expenses for consumables, the driver's labour, and any other expense necessary to give the vehicle in full working order.
The means of transport for economic work must be supplied in a full state of efficiency and correspond to the prescribed characteristics.
Transports of earth or other loose material are assessed on the basis of volume before excavation for materials in heaps before loading onto means of transport, without taking into account the increase in volume.